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Assessment of American Plaice in the Gulf of Maine - Georges Bank Region for 1998

by

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ABSTRACT

This report presents an updated and revised analytical assessment of the Gulf of Maine-Georges Bank American plaice stock for the period 1980-1997 based on analysis of commercial discards, landings and effort data, and research vessel survey data through 1997. Total commercial landings for American plaice were estimated to be 4,000 mt in 1997, a 10% decline from 1996. Commercial landings per unit of effort generally declined from 1964 to 1972, gradually increased to a record high in 1977 and declined to a record low in 1988. Catch rates increased again until 1992, then declined, and have been relatively stable in recent years. Fishery-independent surveys show similar trends in both biomass and numbers of American plaice over the time period. Age 1 recruitment for the 1993 year class was above average, but the more recent year classes are relatively poor. Spawning stock biomass declined from about 49,000 mt in 1980 to 7,800 mt in 1989, subsequently increased and remained relatively stable, and was about 13,000 mt in 1997. Fishing mortality increased from 1980 to 1983, declined until 1990, then increased to a record high of 0.79 (50% exploitation) in 1995, and declined to 0.47 (34% exploitation) in 1997. At the current level of exploitation landings are projected to decline to about 3,000 mt in 1999 and spawning stock biomass is expected to decline to about 6,500 mt in 2000.

INTRODUCTION

American plaice, *Hippoglossoides platessoides*, is distributed along the continental shelf from southern Labrador to Montauk Point, New York. In U.S waters, plaice are most abundant in the deeper (> 50 m) waters of the Gulf of Maine and off the northern edge of Georges Bank (Figure 1). Spawning occurs in the spring from February to June, with peak spawning occurring in April and May. Median maturity for females occurs at 3.6 years and 26.8 cm, and for males at 3.0 years and 22.1 cm (O'Brien *et al.* 1993). The maximum age attained is between 24-30 years and the maximum size is 70-80 cm (Bigelow and Schroeder 1953). After age four, the growth rate for females is faster than that of males (Sullivan 1981).

The fishery for American plaice developed in the mid-seventies as other popular flounder stocks became less abundant and fisheries more heavily regulated (Sullivan 1981). Historically, American plaice had either been discarded or used as bait (Lange and Lux 1979).

This report presents an updated and revised analytical assessment of the Gulf of Maine-Georges Bank American plaice stock for the period 1980-1997 based on analysis of commercial discards, landings and effort data, and research vessel survey data through 1997. This is the second analytical assessment of this stock.

THE FISHERY

Commercial Landings

Since 1960, US landings of American plaice have ranged from 1,309 mt (1960) to 15,126 mt (1982) (Table 1, Figure 2). As the fishery developed, landings gradually increased from an average of 2,280 mt during 1972-1976 to an average of 12,694 mt during 1979-1984. Subsequently, landings declined to 2,300 mt in 1989, then increased to 6,400 mt in 1992 and then gradually declined to 4,000 mt in 1997.

Otter trawl gear has accounted for the largest percentage of American plaice landings each year since 1980. In 1997, about 94% of the landings were caught by otter trawl and about 3% by gill net gear (Table 2). The fishery occurs primarily during the second and third quarter of the year (Table 3). Historically, the majority of the landings were in the large (large+jumbo) market category for all four quarters, however, in 1988, the majority of the landings shifted to the small category (small+peewee) in quarters 3 and 4. Since 1991 landings have been primarily in the small category in all four quarters (Table 4).

Commercial Fishery Sampling Intensity

The number of length and age samples taken are summarized for each year by quarter and market category in Table 5. The average number of metric tons landed per length frequency sample by market category, ranged from 34 to 116 mt during 1985-1991. During 1992-1995, the sampling intensity decreased, ranging between 97 to 336 mt per sample. Sampling intensity has increased since 1996, ranging between 53 and 189 mt per sample.

Commercial Landings Age Composition

Age-length keys

American plaice landings have been sampled for both length composition and age at length since about 1975. Commercial age samples have not been routinely aged, however, samples for 1985-1997 are now available and have been applied in this assessment. The combined Gulf of Maine-Georges Bank age composition for 1980-1984 landings were taken from O'Brien *et al.* (1992).

A study by Esteves and Burnett (1993) concluded that there were significant growth differences between American plaice in the Gulf of Maine and Georges Bank based on analyses of 1988 samples from commercial landings and from NEFSC spring and autumn bottom trawl surveys. In the current assessment, Fisher's exact test (Zar 1984, SAS 1990) was used to test the hypothesis of no difference in the proportion at age within a length class between Gulf of Maine and Georges Bank age length keys derived from commercial samples, by quarter, for the combined 1985-1990 data. The hypothesis of no difference in the proportion at age within a length class between quarters 1 and 2 and between quarters 3 and 4 was also tested for each area.

Results indicate significant differences ($P < 0.05$) in the proportions at age within 2 cm length groups between Gulf of Maine samples and Georges Bank samples. For quarters 1-4 there were, respectively, 9 out of 21, 11 out of 21, 16 out of 24, and 4 out of 20 significant differences in the proportion at age within a length between the two areas (Appendix 1, Table 1). The number of significant differences is more than expected by chance, and are consecutive within the range of 28-58 cm. These results indicate that there is a difference in the age at length between the Gulf of Maine and Georges Bank American plaice.

Results of the Fisher's test for comparison of proportion at age within a length between quarters for each area (Appendix 1, Table 2) indicated greater differences between quarters for the Gulf of Maine than for Georges Bank. For the Gulf of Maine, there were 5 out of 21, and 6 out of 22 significant differences between quarters 1 and 2, and 3 and 4, respectively. For Georges Bank, there were 4 out of 20 significant differences between quarter 1 and 2, and none for quarters 3 and 4. These results indicate some differences between quarters, but only within a narrow range of lengths, 36-46 cm.

Based on these results, the age composition of the 1985-1993 commercial landings were derived separately for the Gulf of Maine and Georges Bank area, and areas were pooled only when sampling was not adequate. The 1994-1997 data were pooled over the entire area because of inadequate sampling by area and uncertainty in the spatial assignment of samples. Samples were generally applied on a quarterly basis, but when samples were not adequate, pooling to semi-annual or annual level was necessary.

Age composition

The pooled age composition of the 1980-1984 landings (Table 6) from the Gulf of Maine-Georges Bank region was estimated, by market category, from seasonal age-length keys derived from the NEFSC groundfish surveys and quarterly length compositions derived from the sampled commercial landings (O'Brien *et al.* 1992). The age composition of the 1985-1993

landings from the Gulf of Maine and from Georges Bank were estimated separately, by market category, from commercial length frequency and age samples, pooled by calendar quarter. The pooled age composition of the 1994-1997 landings from the Gulf of Maine-Georges Bank region were estimated by market category from commercial length frequency and age samples pooled by calendar quarter. In quarters where the sampling was not adequate samples were pooled semi-annually or annually (Table 5). Due to the lack of adequate sampling in every market category for each area, the five market categories were collapsed to three: small + peewee, medium, and large + jumbo. Landed mean weights were estimated by applying the American plaice length weight equation (Lux 1969):

$$Weight(kg) = (2.4548 \times 10^{-6}) \times Length(cm)^{3.345}$$

to quarterly length frequencies, by market category. Total numbers landed by quarter were estimated by dividing the mean weights into quarterly landings, by market category, and prorating according to the sample length frequency. Age-length keys were then applied to the quarterly numbers at length, by market category, to obtain the quarterly catch at age. For the 1980-1984 data, the spring NEFSC groundfish age samples were applied to the numbers at length distribution from quarters one and two, and the autumn NEFSC groundfish age samples were applied to the numbers at length distribution for quarters three and four (O'Brien *et al.* 1992). Numbers at age were summed over market category within each quarter and annual estimates of landings at age were obtained by summing over quarters. Numbers at age for the Gulf of Maine and for Georges Bank were combined to obtain the estimated annual numbers at age and were expanded to the total landings (Table 1) by the ratio of (total landings)/ (Gulf of Maine-Georges Bank landings). The ratios varied between 1% and 12%.

Commercial Fishery Discards

Data for estimating discarded catch is available in the Sea Sampling Database (SSDBS; 1989-1997) and the Vessel Trip Log (VTR; 1994-1997) database. The data available in the SSDBS for discarded American plaice are summarized in Appendix 2 Table 1, as the number of trips sampled for discarded and kept samples, and the number of samples. The number of trips and amount of kept and discarded catch (mt) is summarized for the sea sample data (Appendix 2 Table 2) and for the VTR data (Appendix 2 Table 3).

The quantity of American plaice discarded was estimated separately for the Northern shrimp fishery and the large mesh otter trawl fishery. No discard estimates were derived for the small mesh otter trawl fishery.

Northern Shrimp Fishery

The total number of American plaice discards at length in the Gulf of Maine northern shrimp fishery were derived based on the methodology described by Mayo *et al.* (1992). An indirect estimation of discards for 1980-1988 was derived from NEFSC bottom trawl data and a direct estimation of discards for 1989-1997 was calculated from NEFSC sea-sampling data. For both time periods, discards were estimated for 2 fishing areas and two seasons. Fishing Area 1 and 2 were defined, respectively, as north and south of 43 degrees 15 minutes latitude as described by

Clark and Power (1991). The winter fishing season was defined by combining December of the previous year with January and February, and the spring season was defined by combining March, April, and May. The total number of shrimp otter trawl trips is summarized by month in Table 7.

Discard estimates prior to implementation of the Sea Sampling Program in 1989 were derived using NEFSC length frequency data, a selectivity ogive for the shrimp otter trawl, and a sorting ogive. American plaice abundance indices by 2 cm length intervals (stratified mean number per tow) were computed from NEFSC spring and autumn bottom trawl survey data corresponding to the area of the shrimp fishery (NEFSC offshore survey strata 26, 27, 38, and 40). The original numbers per tow at length were then filtered through a 46 mm mesh selection ogive derived from analyses of the 99 mm mesh selection data for American plaice presented by Smolowitz (1983), and a sorting ogive based on the minimum plaice landing sizes observed in the landed component of the otter trawl catches (Mayo *et al.* 1992). The total number of plaice discarded at length by season was computed by raising the filtered survey indices by the catchability coefficients (q) determined from the sea sample data, and the total amount of shrimp fishing effort (number of trips) as described by Mayo *et al.* (1992). Age composition of the estimated discarded numbers at length were derived by applying seasonal age length keys from the NEFSC bottom trawl surveys.

Direct estimates of discard rates (lbs/trip) for 1989-1997 were estimated by summarizing total pounds discarded and number of trips by season. A geometric mean discard per trip was computed by exponentiating the mean of log discard per trip (Table 8). Discard rates (lbs/trip) for each year-season-area stratum were then raised to total discarded weight by the number of trips for each stratum. Discards were combined by area to obtain total discards (lbs) by season. The length-weight equation for American plaice (Lux 1969) was applied to the sea sample length frequency by season to obtain a sample mean weight. Total discard numbers by season were estimated by dividing the total discard weight by the sample mean weight. Total discards at length were derived by prorating the total numbers to the sampled length frequency. The age composition of the discard length frequency was derived by applying age samples obtained from sea sampling supplemented with seasonal age-length keys from the NEFSC surveys. The seasonal age compositions were summarized to obtain an annual age composition of discarded American plaice in the shrimp fishery (Table 9).

Large Mesh Otter Trawl

The total number of American plaice discards at length in the large mesh otter trawl fishery in the Gulf of Maine-Georges Bank region was derived using the survey method described by Mayo *et al.* (1992). The model utilizes abundance of American plaice at length as indicated by NEFSC bottom trawl survey indices filtered through mesh size and sorting ogives to approximate the relative composition of the retained and discarded components of the catch. The minimum regulated mesh size increased over the time period from 130 mm (5.0") to 140 mm (5.5") to 155 mm (6") diamond or square mesh. Mesh selection ogives were derived from studies by Walsh *et al.* (1992).

The retained portion of the survey length composition was compared to the estimated number landed at length, and coefficients relating landings and retained survey abundance of

plaice were determined for each semi-annual period from 1980-1997. The coefficients were then applied to the discarded portion of the survey length composition for the same semi-annual periods to expand the indices at length to estimated numbers discarded. The numbers discarded at length were adjusted by the proportion of total plaice landings caught by large mesh otter trawl gear (Table 10). The age composition of the discard length frequency was then derived by applying age length keys obtained from sea sampling supplemented with seasonal age-length keys from the NEFSC surveys. The semi-annual age compositions were summarized to obtain an annual age composition of discarded American plaice in the large mesh otter trawl fishery (Table 11).

Total Commercial Fishery Age Composition and Mean Weight at Age

The catch in numbers and weight (mt) and the mean weight at age for the total commercial catch including landings and discards from the shrimp and large mesh otter trawl fishery are presented in Table 12 for the Gulf of Maine-Georges Bank region for 1980-1997. The most recent dominant year classes evident in the catch at age are 1987 and 1992. The values for mean weight vary among years and there does not appear to be any trends over time. The variability in mean weight in the older year classes is most likely due to poor sampling.

Commercial Catch Rates

The landings per day fished (L/DF) for otter trawl trips from the Gulf of Maine-Georges Bank area were estimated for ton classes 2-4 for trips that landed any amount of American plaice and for trips that landed 50% or more American plaice (50% trips) during 1964-1997 (Table 13). The total L/DF was estimated by summing the individual ton class L/DF weighted by the percentage of the total landings. The total L/DF for the 50% trips and for all trips landing American plaice generally declined from 1964 to 1972 then gradually increased to a record high in 1977 and gradually declined to a record low in 1988. Catch rates increased again until 1992, then declined and have been relatively stable in recent years (Table 13, Figure 3). Catch rates for 1994-1997 are summarized by ton class by quarter in Table 14. Nominal fishing effort (df) for all trips landing any amount of plaice increased between 1971-1985, remained relatively high between 1985 and 1992, but has declined since 1993 (Figure 4).

Research Survey Indices

Indices of abundance and biomass were estimated for American plaice from both the NEFSC and the Massachusetts Division of Marine Fisheries (MADMF) spring and autumn bottom trawl surveys. The NEFSC stratified mean number per tow by age and stratified mean weight per tow estimates, adjusted for differences in fishing power of the Albatross IV and the Delaware II are presented in Table 15 and Figures 5-6. Abundance indices were adjusted by 0.82 and biomass indices were adjusted by 0.69 for surveys conducted by the Delaware II (NEFSC 1991). Indices of abundance from the NEFSC surveys indicate strong year classes occurring in 1978, 1979, 1981, 1987 and 1992 (Appendix 3, Table 1, Figure 7). The MADMF survey indicates strong 1984, 1987, and 1992 year classes (Appendix 3, Table 2).

Mortality

Instantaneous natural mortality was assumed to be 0.2, based on studies of unexploited stocks by Pitt (1972). Fishing mortality estimates were derived by combining all research surveys and calculating a 3-point moving average (Figure 8). Mortality estimates are highly variable throughout the time series and appear to be lower in the latter half (1989-1997) of the time series.

ESTIMATES OF STOCK SIZE AND FISHING MORTALITY

Virtual Population Analysis Calibration

The ADAPT calibration method (Parrack 1986, Gavaris 1988, Conser and Powers 1990) was used to derive estimates of fishing mortality in 1997 and beginning year stock sizes in 1998. The catch-at-age used in the VPA consisted of combined commercial landings and estimated discards from 1980-1997 for ages 1-8 with a 9+ age group. The indices of abundance used to calibrate the VPA included the NEFSC 1980-1997 spring research survey abundance indices for ages 1-8, the MADMF 1982-1997 spring research survey abundance indices for ages 1-5, the NEFSC 1980-1997 autumn research survey abundances for ages 2-8, and the MADMF 1982-1997 autumn research survey abundance indices for ages 2-6. The autumn survey indices were lagged forward one age and one year to match cohorts in the subsequent year. Results of preliminary VPA calibrations are presented in Table 16.

The final ADAPT formulation provided stock size estimates for ages 2-8 in 1998 and corresponding F estimates for ages 1-7 in 1997. Assuming full recruitment at age 5, the F on age 8 in the terminal year was estimated as the average of the F on ages 5 through 7. The F on age 8 in all years prior to the terminal year was derived from weighted estimates of Z for ages 5 to 7. For all years, the F on age 8 was applied to the 9+ age group. Spawning stock biomass (SSB) estimates were derived by applying a constant ogive (O'Brien *et. al* 1993).

The final ADAPT calibration results for estimates of F, stock size, and SSB at age are presented in Table 17 and Appendix 4. Estimates of stock size were more precise for ages 2-7 (CVs ranging from 0.18 to 0.29) than for age 8 (CV=0.35). The residual patterns of the indices did not show any strong trends for the four surveys (Figure 9).

Average fully recruited fishing mortality (ages 5-8) in 1997 was estimated as 0.47, an increase of 10% from 1996 (Table 17, Figure 10). The 1997 estimate of SSB was 13,500 mt, an increase of 11% from 1996 (Table 17, Figure 11). Since 1980, recruitment has ranged from 12 million (1984 year class) to 57 million (1992 year class). Recruitment since 1993 has been near record low values and the 1997 estimate is the lowest in the time series (Table 17, Figure 11).

The relationship of recruitment at age 1 to spawning stock biomass is presented in Figure 12. The typical stock-recruit relationship of increased recruitment with increasing spawning stock biomass is not apparent for this stock. During 1986-1993 the stock appears to be under a different regime than during 1980-1985 and 1994-1996 suggesting that recruitment is influenced by some other factor (i.e. temperature, predation) other than spawning stock biomass.

Precision Estimates of F and SSB

A conditional non-parametric bootstrap procedure (Efron 1982) was used to evaluate the uncertainty associated with the estimates of fishing mortality and spawning stock biomass from the final VPA. One thousand bootstrap iterations were performed to estimate standard errors, coefficients of variation (CVs), and bias for age 2-8 stock size estimates at the start of 1998, catchability estimates (q) for indices of abundance, and age 1 to 7 F's in 1997 (Appendix 5).

The bootstrap results indicate that stock sizes were well estimated for ages 2 to 8 with CVs varying between 0.16 and 0.33. The CVs for the catchability coefficients for all indices ranged between 0.13 and 0.15. The fully recruited F for ages 5+ was well estimated with a CV=0.15. The bootstrap estimate of 0.485 was only slightly higher than the NLLS estimate. The 1997 fully recruited average F estimates, derived from the 1000 bootstrap iterations, ranged from 0.32 to 0.79 (Figure 13). There is an 80% probability that the average F in 1997 was between 0.41 and 0.57.

The bootstrap results indicate that spawning stock biomass was reasonably well estimated (CV=0.10) and slightly higher than the NLLS estimate of 13,454 mt. The 1997 spawning stock biomass estimates, derived from the 1000 bootstrap iterations, ranged from 9,500 to 19,500 mt (Figure 14). There is an 80% probability that the 1997 SSB was between 12,000 and 15,000 mt.

Retrospective Analysis

A retrospective analysis was performed to evaluate how well the current ADAPT calibration would estimate spawning stock biomass, fishing mortality, and recruits at age 1 for the four years prior to the current assessment, 1993-1996. Convergence of the estimates generally occurs after about six years (Figures 15-17). The retrospective analysis indicates some tendency to underestimate the age 1 recruits (Figure 15). The exception are the 1993 and 1994 estimates that were well below the 1995-1997 estimates. Estimates of SSB appear to be only slightly overestimated (Figure 16). F is underestimated for 1993-1995 and almost equivalent to the current assessment for 1996 and 1997 (Figure 17).

BIOLOGICAL REFERENCE POINTS

Yield and Spawning Stock Biomass per Recruit

Yield, total stock biomass, and spawning stock biomass per recruit were estimated using methodology of Thompson and Bell (1934). The estimates were derived from arithmetic means of the 1980-1997 catch mean weight at age (Table 12) and stock mean weight at age. Proportion mature at age were obtained from O'Brien *et. al* (1993). A partial recruitment vector was calculated from the geometric mean of the 1994-1996 F estimates from the final VPA (Table 17), coinciding with the change in mesh regulations in 1994. The final exploitation pattern was derived by dividing the geometric mean F at age by the geometric mean of the unweighted average F for ages 5 to 8 and smoothed by applying full exploitation at ages 5 and older. The exploitation pattern of:

Age 1: 0.02, Age 2: 0.05, Age 3: 0.08, Age 4: 0.42, Age 5: 1.00

reflects a decrease in the exploitation at age 3 and an increase at ages 4 and 5 relative to the previous assessment (O'Brien *et al.* 1992). Input values and results for the yield-per-recruit analysis are provided in Table 18 and Figure 18. The resulting biological reference points were $F_{0.1}=0.19$, $F_{\max}=0.35$, and $F_{20\%}=0.40$, compared to $F_{0.1}=0.18$, $F_{\max}=0.29$, and $F_{20\%}=0.49$ from the previous assessment.

Several other exploratory yield-per-recruit analyses were performed using catch mean weight at age disaggregated by landings, large mesh otter trawl discards, and shrimp fishery discards. The proportion of F for each of these components was also applied. The resulting biological reference points were $F_{0.1}=0.16$ and $F_{\max}=0.26$, based on the landings per recruit (Table 19).

An additional analysis was performed to address the recommendation of SAW 14 to simulate the effect of the removal of the shrimp fishery on stock status and biological reference points. A yield per recruit analysis was performed using the average weight of the landings and large mesh discards combined, and a fishing mortality pattern that represented only the landings and large mesh fishery discards. Results indicate F would have to increase 15% ($F_{\max}=0.40$) to achieve a 4% increase in yield per recruit at F_{\max} (Table 20).

MSY Based Reference Points

Estimates of maximum sustainable yield (MSY) and SSB_{MSY} were derived using the long term average recruitment and current estimates of yield per recruit and spawning stock biomass per recruit at $F_{0.1}=0.19$. MSY is estimated to be about 4,400 mt and SSB_{MSY} is estimated to be about 24,200 mt. These estimates differ for those provided by the Overfishing Definition Review Panel (NEFMC 1998) which appear to be incorrect.

The Panel recommended a control law with $F_{0.1}$ as the maximum fishing mortality threshold when the stock is greater than SSB_{MSY} then decreasing linearly to zero at 1/4 of SSB_{MSY} . Given our current estimate of $F_{0.1}$ (0.19) and SSB_{MSY} (24,200 mt) and the control law recommended by the Panel, the target F would be set at 60% of $F_{0.1}$ ($F_{target}=0.11$) when SSB is above SSB_{MSY} and would decrease linearly to zero at ½ of SSB_{MSY} (12,100 mt) (Figure 19). The 1997 SSB estimate is 13,500 mt and the 1998 projected SSB is 10,800 mt.

PROJECTIONS

Short term, three year stochastic projections were performed to estimate landings and SSB during 1998-2000 under the F scenarios of $F_{98}=0.48$, $F_{0.1}=0.19$, $F_{20\%}=0.40$, and $F=0.0$ (no fishing). Data input are the same as described in the yield per recruit analysis and in addition, discard mean weight at age was derived as the arithmetic mean of the 1980-1997 estimates (Table 21). Recruitment in 1998 was derived from the distribution of geometric mean recruitment calculated from bootstrapped VPA estimates (1979-1996 year classes). Recruitment for 1999 and 2000 was estimated as the median value of the observed 1980-1997 recruitment at age 1 (Table 17).

At a fishing mortality of 0.48, landings are projected to be about 3,000 mt in 1999, and decline to 2,200 mt in 2000 (Table 21, Figure 20). SSB decreases to about 8,600 mt in 1999 and declines

further to 6,500 mt in 2000. Fishing at $F_{0.1} = 0.19$, landings will decline to 1,400 mt in 1999 and remain stable at about 1,300 mt in 2000. SSB at $F_{0.1}$ will decline in 1999 (9,100 mt) and continue to decline in 2000 (8,600 mt). If fishing mortality is reduced to zero, SSB will decline in 1999 (9,500 mt) and increase minimally in 2000 (10,400 mt) due to the below average recruitment in recent years (Table 21).

CONCLUSIONS

The Gulf of Maine-Georges Bank stock of American plaice is at a low biomass level, compared to the long term average mid-year biomass. Biomass indices derived from autumn research surveys indicate that the stock size has been near or below the long term average since 1984. Fishing mortality increased rapidly from an estimated 0.43 in 1991 to a record high of 0.75 in 1995. Fishing mortality in 1997 was 0.47, more than two and a half times $F_{0.1} = 0.18$. Spawning stock biomass declined steadily from 49,000 mt in 1980 to a record low value in 1990 (8,700 mt) and increased to about 13,000 mt in 1997. Although the largest year class on record occurred in 1992, recent year classes (1994, 1995, 1996) are among the lowest observed, and well below the long term average.

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Table 1. Commercial landings (metric tons, live weight) of American plaice from the Gulf of Maine, Georges Bank, Southern New England and the Mid-Atlantic, 1960-1997.

Year	Gulf of Maine			Georges Bank					Southern New England				Mid - Atlantic			Grand Total		
	USA	Can	Total	USA	Can	USSR	Other	Total	USA	USSR	Other	Total	USA	Other	Total	USA	Other	Total
1960	620	1	621	689	-	-	-	689	-	-	-	0	-	-	0	1309	1	1310
1961	692	-	692	830	-	-	-	830	-	-	-	0	-	-	0	1522	0	1522
1962	694	-	694	1233	44	-	-	1277	-	-	-	0	-	-	0	1927	44	1971
1963	693	-	693	1489	127	24	-	1640	-	-	-	0	-	-	0	2182	151	2333
1964	811	-	811	2800	177	-	11	2988	-	-	-	0	-	-	0	3611	188	3799
1965	967	-	967	2376	180	112	-	2668	-	-	-	0	-	-	0	3343	292	3635
1966	955	2	957	2388	242	279	1	2910	-	-	-	0	-	-	0	3343	524	3867
1967	1066	6	1072	2166	203	1018	10	3397	-	-	-	0	4	-	4	3236	1237	4473
1968	904	5	909	1695	173	193	5	2066	637	145	-	782	18	2	20	3254	523	3777
1969	1059	7	1066	1738	71	63	17	1889	505	349	-	854	130	-	130	3432	507	3939
1970	895	-	895	1603	92	927	658	3280	88	18	40	146	8	-	8	2594	1735	4329
1971	648	5	653	1511	36	228	296	2071	11	112	206	329	6	2	8	2176	885	3061
1972	569	-	569	1222	22	358	-	1602	3	71	-	74	-	-	0	1794	451	2245
1973	687	-	687	910	38	289	-	1237	5	158	-	163	-	-	0	1602	485	2087
1974	945	2	947	1039	27	16	2	1084	92	4	-	96	-	-	0	2076	51	2127
1975	1507	-	1507	913	25	148	-	1086	3	-	-	3	-	-	0	2423	173	2596
1976	2550	-	2550	948	24	3	-	975	10	-	-	10	1	-	1	3509	27	3536
1977	5647	-	5647	1408	35	50	-	1493	6	78	-	84	7	-	7	7068	163	7231
1978	7287	30	7317	2193	77	-	-	2270	15	-	-	15	8	-	8	9503	107	9610
1979	8835	-	8835	2478	23	-	-	2501	13	-	7	20	4	-	4	11330	30	11360
1980	11139	-	11139	2399	43	-	5	2447	10	-	-	10	1	-	1	13549	48	13597
1981	10327	1	10328	2482	15	-	2	2499	26	-	2	28	46	-	46	12881	20	12901
1982	11147	-	11147	3935	27	-	1	3963	35	-	2	37	9	-	9	15126	30	15156
1983	9142	7	9149	3955	30	-	-	3985	40	-	-	40	4	-	4	13141	37	13178
1984	6833	2	6835	3277	6	-	-	3283	17	-	-	17	7	-	7	10134	8	10142
1985	4766	1	4767	2249	40	-	-	2289	12	-	-	12	2	-	2	7029	41	7070
1986	3319	-	3319	1146	34	-	-	1180	4	-	-	4	3	-	3	4472	34	4506
1987	2766	-	2766	1032	48	-	-	1080	2	-	-	2	1	-	1	3801	48	3849
1988	2271	-	2271	1097	108	-	-	1205	13	-	-	13	1	-	1	3382	108	3490
1989	1646	-	1646	703	68	-	-	771	1	-	-	1	3	-	3	2353	68	2421
1990	1802	-	1802	639	51	-	-	690	2	-	-	2	2	-	2	2445	51	2496
1991	2936	-	2936	1310	-	-	-	1310	15	-	-	15	0	-	0	4261	0	4261
1992	4564	2	4566	1838	-	-	-	1838	10	-	-	10	4	-	4	6416	2	6418
1993	3865	-	3865	1838	-	-	-	1838	11	-	-	11	4	-	4	5718	0	5718
1994	3402	29	3431	1560	2	-	-	1562	21	-	-	21	83	-	83	5066	31	5097
1995	3123	3	3126	1486	-	-	-	1486	16	-	-	16	20	-	20	4645	3	4648
1996	2920	2	2922	1423	-	-	-	1423	39	-	-	39	14	-	14	4396	2	4398
1997	2331	65	2396	1560	-	-	-	1560	22	-	-	22	24	-	24	3937	65	4002

** 1994-1997 data are spatially distributed based on proportions of landings recorded by area in the VTR database and are considered provisional.

Table 2. Percentage of landings of American plaice by gear type, 1980-1997.

Year	Otter	Shrimp	<u>GEAR TYPE</u>			Other
	Trawl	Trawl	Sink	Scottish	Danish	
1980	96.8	0.7	0.8	0.0	1.5	0.3
1981	96.5	2.2	0.7	0.0	0.5	0.1
1982	96.3	2.0	0.8	0.5	0.3	0.1
1983	96.3	1.7	0.3	1.1	0.3	0.3
1984	97.2	1.0	0.2	0.6	0.6	0.4
1985	96.9	1.6	0.1	0.5	0.8	0.1
1986	96.1	2.5	0.3	0.3	0.7	0.1
1987	95.5	2.6	0.6	0.4	0.9	0.2
1988	96.2	1.7	0.6	0.4	1.0	0.2
1989	95.5	1.4	1.2	0.9	1.0	0.1
1990	93.4	2.2	2.0	0.9	1.2	0.4
1991	94.8	0.9	0.9	1.2	0.9	1.2
1992	96.1	1.3	0.1	0.9	0.2	1.4
1993	95.9	1.2	0.1	0.0	0.3	2.5
1994	97.2	0.1	1.1	0.2	0.0	1.4
1995	93.0	0.7	4.0	0.7	0.0	1.6
1996	94.6	0.1	3.2	0.7	0.0	1.4
1997	93.8	0.2	2.9	0.7	0.0	2.4

Table 3. Combined market category landings (mt) of American plaice, excluding unclassified category, for the Georges Bank - Gulf of Maine region (areas 511-515, 522-526, 561-562), by quarter, 1980-1997.

	Q1	Q2	Q3	Q4	Total
1980	2087	5065	3429	1967	12548
1981	2505	4791	3219	1989	12504
1982	2049	5704	4358	2440	14551
1983	2562	5347	3340	1765	13014
1984	1750	3958	2735	1589	10032
1985	1315	2768	1918	961	6962
1986	728	1901	1079	699	4407
1987	581	1479	1044	571	3675
1988	576	1221	923	386	3106
1989	350	931	585	356	2222
1990	306	780	793	454	2333
1991	331	1309	1505	939	4084
1992	764	2339	2183	1097	6383
1993	867	2082	1561	1054	5564
1994	599	1831	1586	999	5015
1995	530	1820	1414	829	4593
1996	529	1585	1407	836	4357
1997	578	1446	1201	636	3861

Table 4. Landings by market category (Sm = small + peewee; Md=medium; Lg=large+jumbo; Un=unclassified) for statistical areas 511-515, 521-522, 525-526, 561-562 for American plaice, 1980-1997. (1994-1997 includes all areas).

YEAR	Quarter 1				Quarter 2				Quarter 3				Quarter 4				Total			
	Sm	Md	Lg	Un	Sm	Md	Lg	Un	Sm	Md	Lg	Un	Sm	Md	Lg	Un	Sm	Md	Lg	Un
1980	565	0	1527	3	1398	0	3667	100	1026	0	2399	16	479	0	1488	1	3468	0	9081	120
1981	730	0	1775	26	1233	0	3557	253	993	0	2209	34	457	0	1532	2	3413	0	9073	315
1982	581	0	1468	11	1353	5	4350	318	1191	524	2643	131	571	299	1570	40	3696	827	10031	500
1983	580	356	1624	5	1488	713	3148	57	1027	497	1816	18	399	276	1090	3	3494	1843	7678	83
1984	431	247	1071	10	954	649	2355	27	812	479	1444	19	372	309	909	13	2568	1684	5779	70
1985	512	253	708	14	709	511	1548	22	503	369	1046	13	239	188	521	9	1963	1321	3823	59
1986	187	132	409	13	539	350	1014	33	342	201	536	11	202	146	349	6	1269	829	2308	63
1987	169	108	304	20	460	275	744	43	367	203	475	20	199	126	246	35	1195	711	1768	117
1988	203	94	279	39	447	244	529	75	433	186	303	47	155	88	143	36	1238	612	1254	197
1989	117	76	158	25	300	208	423	68	222	126	222	29	139	81	135	21	778	491	938	142
1990	101	66	142	19	269	194	317	49	323	196	273	20	190	118	146	19	883	573	879	107
1991	138	78	116	20	594	347	367	61	773	378	353	40	435	263	241	41	1939	1066	1077	162
1992	302	174	291	35	902	634	805	112	887	624	674	80	426	278	394	17	2517	1710	2164	244
1993	276	181	410	17	702	515	867	80	589	371	602	26	423	232	401	14	1990	1299	2280	137
1994	237	120	243	22	685	434	711	15	692	387	506	8	437	218	345	6	2051	1159	1805	51
1995	214	117	198	10	811	425	585	29	800	287	327	9	436	178	216	4	2261	1007	1326	52
1996	240	108	180	4	808	343	434	22	913	242	253	10	493	159	183	3	2454	852	1050	39
1997	322	99	158	2	696	390	360	56	550	406	245	16	321	176	139	2	1889	1071	902	76

Table 5. Sampling of commercial American plaice landings, by market category, for the Gulf of Maine and Georges Bank areas (NAFO Division 5Y and 5Z), 1985-1997. Outline indicates samples pooled to estimate landings at age.

	Small				Medium				Large				Number of tons landed / sample						
	Q1		Q2		Q3		Q4		Q1		Q2		Q3		Q4		Sm.	Med.	Lrg.
1985 GB	2	4	14	3	—	2	2	2	—	3	7	1	—	—	—	—	49	55	116
GM	2	5	5	5	3	1	9	5	3	10	6	5	—	—	—	—			
total	4	9	19	8	3	3	11	7	1	13	13	6	—	—	—	—			
1986 GB	3	6	5	3	2	4	3	2	1	4	3	2	—	—	—	—	33	35	56
GM	9	5	3	5	3	4	5	1	10	10	7	4	—	—	—	—			
total	12	11	8	8	5	8	8	3	11	14	10	6	—	—	—	—			
1987 GB	4	5	5	1	—	2	3	2	2	4	4	1	—	—	—	—	39	40	63
GM	2	6	5	3	1	5	2	3	3	3	6	5	—	—	—	—			
total	6	11	10	4	1	7	5	5	5	7	10	6	—	—	—	—			
1988 GB	3	7	4	2	1	3	4	2	4	5	2	4	—	—	—	—	34	21	40
GM	4	7	4	5	6	6	4	3	6	5	3	2	—	—	—	—			
total	7	14	8	7	7	9	8	5	10	10	5	6	—	—	—	—			
1989 GB	2	5	5	—	1	1	6	1	5	3	3	—	—	—	—	—	35	29	63
GM	1	3	3	3	1	—	4	3	2	1	—	1	—	—	—	—			
total	3	8	8	3	2	1	10	4	7	4	3	1	—	—	—	—			
1990 GB	—	5	6	—	2	1	2	2	—	2	5	—	—	—	—	—	33	26	42
GM	5	5	3	3	1	6	3	5	1	5	3	5	—	—	—	—			
total	5	10	9	3	3	7	5	7	1	7	8	5	—	—	—	—			
1991 GB	—	3	1	—	3	1	1	—	3	3	2	—	—	—	—	—	78	67	67
GM	5	3	7	6	3	1	4	3	—	1	5	2	—	—	—	—			
total	5	6	8	6	6	2	5	3	3	4	7	2	—	—	—	—			
1992 GB	—	4	1	—	—	1	1	—	—	2	2	1	—	—	—	—	168	143	155
GM	1	5	2	2	1	4	3	2	2	2	3	2	—	—	—	—			
total	1	9	3	2	1	5	4	2	2	4	5	3	—	—	—	—			
1993 GB	—	2	1	1	—	1	—	—	—	3	2	1	—	—	—	—	133	260	253
GM	2	4	4	1	—	2	2	—	—	1	2	—	—	—	—	—			
total	2	6	5	2	0	3	2	0	0	4	4	1	—	—	—	—			
1994 GB	—	—	—	—	—	—	1	1	—	—	1	—	—	—	—	—	205	97	181
GM	—	2	5	3	—	4	3	3	—	2	3	3	—	—	—	—			
total	0	2	5	3	0	4	4	4	0	3	3	4	—	—	—	—			
1995 GB	1	—	—	—	1	—	—	—	1	—	—	—	—	—	—	—	323	336	332
GM	1	3	—	2	—	2	—	—	1	2	0	1	—	—	—	—			
total	2	3	0	2	1	2	0	0	1	2	0	1	—	—	—	—			
1996 GB	—	2	2	1	—	1	4	—	—	2	1	1	—	—	—	—	189	53	75
GM	2	3	2	1	—	2	1	3	5	2	3	1	4	2	—	—			
total	2	5	4	2	—	2	2	7	5	3	3	5	3	—	—	—			
1997 GB	2	4	2	3	—	2	3	1	—	2	—	—	—	—	—	—	82	77	69
GM	4	4	3	1	—	2	3	3	—	1	5	3	2	—	—	—			
total	6	8	5	4	—	2	5	6	1	1	7	3	2	—	—	—			

Table 6. Landings at age (thousands of fish; metric tons), mean weight (kg), and mean length (cm) at age of commercial landings of American plaice from Gulf of Maine - Georges Bank, and South, 1980-1997.

Year	Age															Total
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	
Landings in Numbers (000's) at Age																
1980	0	0	0	22	770	3129	3903	3629	1185	1139	850	323	155	215	687	16007
1981	0	0	587	1332	4331	5100	3618	2381	1573	645	440	196	146	45	234	20628
1982	0	0	113	2134	3495	4295	3481	3293	2038	1256	737	317	34	137	230	21558
1983	0	0	1	438	3735	4270	3809	2252	1271	697	450	455	230	59	168	17834
1984	0	0	3	253	1298	4819	2865	1913	577	274	307	65	57	0	647	13078
1985	0	0	0	60	786	2066	2787	2213	1081	438	267	79	54	19	30	9880.6
1986	0	0	1	198	1082	1502	1462	1307	631	255	105	51	26	7	15	6644
1987	0	0	15	343	486	1703	1271	891	541	187	62	26	15	14	5	5557
1988	0	0	1	446	1148	1456	1427	543	270	177	88	25	13	11	6	5612.5
1989	0	0	0	76	451	686	504	749	469	193	103	35	29	22	31	3345.7
1990	0	0	0	202	846	1049	500	290	349	193	96	74	42	16	29	3685.8
1991	0	0	0	23	1850	2818	1105	319	164	201	97	66	23	9	6	6682.4
1992	0	0	0	46	739	4871	2563	812	191	131	118	38	33	18	4	9564.4
1993	0	0	0	123	1028	2036	2452	1382	265	287	151	71	22	7	25	7847.8
1994	0	0	24	200	914	1903	1287	1178	608	239	153	64	49	26	157	6800.3
1995	0	0	0	141	717	2880	1745	646	582	212	53	26	16	0	8	7027.6
1996	0	0	101	175	2515	2396	1412	533	241	125	35	21	15	22	5	7598
1997	0	0	0	2	1275	2615	1558	620	184	86	67	48	19	11	41	6524.8
Landings at Age (mt)																
1980	0	0	0	6	271	1387	2562	3008	1232	1347	1168	508	269	391	1448	13597
1981	0	0	78	276	1485	2318	2832	2122	1545	729	552	266	257	82	358	12898
1982	0	0	23	620	1166	1845	2007	3164	2320	1502	1144	551	65	224	524	15153
1983	0	0	0	149	1720	2484	2596	1864	1326	867	650	638	405	108	380	13187
1984	0	0	1	84	549	2913	1957	1713	688	310	421	134	93	0	1279	10142
1985	0	0	0	13	212	747	1516	1884	1263	603	445	158	115	42	73	7070
1986	0	0	0	53	349	616	864	1101	741	380	183	102	58	17	42	4506
1987	0	0	3	97	187	809	797	797	636	278	107	56	34	32	15	3849
1988	0	0	0	126	413	689	922	484	333	247	151	49	29	26	20	3490
1989	0	0	0	26	177	335	295	553	403	257	150	62	51	46	66	2421
1990	0	0	0	78	355	547	330	240	338	210	125	104	76	30	62	2496
1991	0	0	0	8	839	1532	790	307	191	256	150	107	46	18	17	4261
1992	0	0	0	22	314	2623	1895	774	237	173	193	72	63	40	13	6418
1993	0	0	0	51	463	1054	1591	1305	327	399	238	126	55	13	94	5718
1994	0	0	3	48	391	1008	807	938	659	308	217	106	92	54	466	5097
1995	0	0	0	51	301	1482	1141	531	652	283	112	51	28	0	17	4648
1996	0	0	17	59	1017	1236	918	490	290	172	55	41	33	57	13	4398
1997	0	0	0	0	541	1245	992	510	208	115	105	82	40	32	131	4002

Table 6 (continued). Landings at age (thousands of fish; metric tons), mean weight (kg), and mean length (cm) at age of commercial landings of American plaice from Gulf of Maine - Georges Bank, and South, 1980-1997.

Year	Age															Average
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	
Mean Weight at age (kg)																
1980	---	---	---	0.285	0.352	0.443	0.656	0.829	1.039	1.183	1.374	1.573	1.732	1.815	2.109	0.849
1981	---	---	0.133	0.207	0.343	0.454	0.783	0.891	0.982	1.130	1.254	1.354	1.755	1.836	1.534	0.625
1982	---	---	0.200	0.291	0.334	0.429	0.577	0.961	1.138	1.196	1.552	1.737	1.944	1.636	2.281	0.703
1983	---	---	0.184	0.341	0.460	0.582	0.682	0.828	1.043	1.244	1.446	1.404	1.762	1.843	2.255	0.740
1984	---	---	0.180	0.331	0.423	0.605	0.683	0.895	1.192	1.133	1.369	2.058	1.628	0.000	1.977	0.775
1985	---	---	0.000	0.221	0.270	0.362	0.544	0.852	1.167	1.377	1.665	1.991	2.115	2.254	2.437	0.715
1986	---	---	0.191	0.267	0.322	0.410	0.591	0.842	1.174	1.491	1.747	2.002	2.207	2.344	2.751	0.678
1987	---	---	0.201	0.284	0.386	0.475	0.627	0.895	1.177	1.483	1.732	2.148	2.213	2.359	2.988	0.692
1988	---	---	0.151	0.282	0.360	0.473	0.646	0.893	1.231	1.396	1.717	1.991	2.265	2.278	3.074	0.622
1989	---	---	0.339	0.393	0.489	0.586	0.739	0.858	1.334	1.463	1.789	1.780	2.106	2.142	0.724	
1990	---	---	0.384	0.420	0.522	0.660	0.826	0.968	1.089	1.305	1.409	1.811	1.881	2.154	0.678	
1991	---	---	0.333	0.453	0.543	0.715	0.963	1.161	1.276	1.541	1.618	2.012	2.050	2.837	0.639	
1992	---	---	0.473	0.424	0.538	0.739	0.953	1.240	1.319	1.640	1.902	1.928	2.151	2.884	0.671	
1993	---	---	0.416	0.451	0.518	0.649	0.945	1.234	1.394	1.577	1.784	2.468	1.989	3.750	0.729	
1994	---	---	0.138	0.239	0.427	0.530	0.627	0.796	1.083	1.289	1.424	1.657	1.880	2.082	2.963	0.750
1995	---	---	0.000	0.359	0.420	0.517	0.685	0.914	1.168	1.099	2.105	1.934	1.757	0.000	2.213	0.517
1996	---	---	0.166	0.339	0.404	0.516	0.650	0.919	1.202	1.383	1.565	1.962	2.127	2.525	2.486	0.579
1997	---	---	0.214	0.424	0.476	0.636	0.822	1.127	1.336	1.570	1.709	2.138	3.084	3.231	0.613	
Mean Length at age (cm)																
1980	---	---	---	32.6	34.7	37.1	41.7	44.8	47.9	49.9	52.2	54.4	56.0	56.7	59.1	44.1
1981	---	---	25.8	28.8	34.0	36.9	43.3	45.2	46.7	48.8	50.3	51.8	55.6	57.0	53.8	39.4
1982	---	---	29.0	32.4	33.7	36.4	39.5	46.3	48.8	49.9	53.9	55.7	58.0	55.0	60.7	40.8
1983	---	---	28.7	34.2	37.2	39.8	41.9	44.2	47.5	50.2	52.9	52.2	56.1	56.9	60.1	42.2
1984	---	---	28.5	33.9	36.3	40.3	41.8	45.3	49.9	49.3	52.2	59.0	54.9	0.0	59.3	42.8
1985	---	---	30.0	31.9	34.6	39.1	45.0	49.6	52.0	55.2	58.2	59.3	60.4	61.8	41.4	
1986	---	---	29.0	31.9	33.6	36.0	40.1	44.6	49.5	53.3	56.0	58.4	60.0	61.1	64.2	40.7
1987	---	---	29.4	32.5	35.5	37.8	41.0	45.6	49.5	53.3	55.8	59.6	60.2	61.3	65.7	41.3
1988	---	---	27.0	32.4	34.8	37.6	41.4	45.6	50.4	52.3	55.7	58.3	60.6	60.6	66.4	39.9
1989	---	---	34.3	35.8	38.2	40.2	43.0	44.6	51.5	52.9	56.2	56.2	59.2	59.4	41.9	
1990	---	---	35.6	36.5	38.9	41.6	44.5	46.7	48.3	51.1	52.3	56.6	57.3	59.5	41.3	
1991	---	---	34.2	37.4	39.4	42.6	46.6	49.3	50.6	53.9	54.5	58.5	58.6	64.8	40.8	
1992	---	---	38.0	36.7	39.2	43.1	46.4	50.5	51.4	54.9	57.5	57.7	59.6	65.2	41.5	
1993	---	---	36.5	37.3	38.8	41.4	46.6	50.5	52.4	54.4	56.5	62.2	58.3	70.4	42.3	
1994	---	---	26.2	30.4	36.7	39.2	41.2	44.2	48.6	51.2	52.6	55.2	57.4	59.2	65.6	42.3
1995	---	---	0.0	35.0	36.6	38.8	41.6	44.6	49.0	51.7	59.4	57.9	56.1	60.3	41.3	
1996	---	---	27.7	34.1	36.2	38.8	41.4	46.1	50.0	52.1	54.3	58.1	59.5	62.6	62.1	39.5
1997	---	---	30.0	36.7	37.9	41.3	44.5	49.0	51.7	54.2	55.6	59.6	66.5	66.9	40.2	

Table 7. Total number of trips in the Gulf of Maine northern shrimp fishery by year, season, and month.

	Winter		Spring			Winter		<u>Total</u>
	<u>Jan</u>	<u>Feb</u>	<u>Mar</u>	<u>Apr</u>	<u>May</u>	<u>Dec</u>		
1980	0	299	263	55	72	0		689
1981	329	653	874	291	4	0		2151
1982	831	1074	1152	252	14	190		3513
1983	1185	1504	796	317	92	467		4361
1984	2017	2328	1457	174	0	777		6753
1985	1785	2079	1348	361	104	852		6529
1986	1704	2980	1367	383	489	1273		8196
1987	2601	3266	2489	884	652	1068		10960
1988	2587	2987	1466	197	147	1158		8542
1989	3149	2816	1102	534	154	1359		9114
1990	2485	1883	2099	1059	350	1093		8969
1991	1980	2502	1283	611	280	570		7226
1992	2366	2647	1246	320	158	381		7118
1993	1451	2096	1310	497	5	502		5861
1994	1666	2290	1190	150	0	1904		7200
1995	2784	2823	1712	1097	0	1858		10274
1996	2556	4114	2044	740	606	2291		12351
1997	2285	3404	1703	1238	853	1224		10707
1998	2086	2105	811	546	375			5923

Table 8. Discard rate (lbs/trip), number of trips and total discards (lbs) of American plaice in the Northern Shrimp fishery for Area 1 (N of 43°15' latitude) and Area 2 (S of 43°15' latitude), 1993-1997.

AREA 1 (N > 43°15' latitude)					AREA 2 (S <= 43°15' latitude)						
Year	Month	Disc. Rate lbs / trip	No. Trips	Total Disc. (lbs)	Year	Month	Disc. Rate lbs / trip	No. Trips	Total Disc. (lbs)	Total Disc. (lbs)	
1989											
Winter	Jan	8.17	1398	11,422	Winter	Jan	33.12	1751	57,993		
	Feb	8.17	1591	12,998		Feb	33.12	1225	40,572		
	total		2989	24,420				2976	98,565	122,985	
Spring	Mar	298.87	469	140,170	Spring	Mar	99.48	633	62,971		
	Apr	298.87	37	11,058		Apr	99.48	497	49,442		
	May	298.87	2	598		May	99.48	152	15,121		
	total		508	151,826		Total		1282	127,533	279,359	
	Dec	109.95	343	37,713		Dec	121.51	1016	123,454	161,167	
Annual Total		3840	213,959				5274	349,553	563,512		
1990											
Winter	Jan	109.95	1041	114,458	Winter	Jan	121.51	1444	175,460		
	Feb	109.95	910	100,055		Feb	121.51	973	118,229		
	total		1951	214,512				2417	293,690	508,202	
Spring	Mar	99.48	1335	132,806	Spring	Mar	81.45	764	62,228		
	Apr	99.48	460	45,761		Apr	81.45	599	48,789		
	May	99.48	44	4,377		May	81.45	306	24,924		
	total		1839	182,944		Total		1669	135,940	318,884	
	Dec	18.17	273	4,960		Dec	73.7	820	60,434	65,394	
Annual Total		4063	402,417				4906	490,064	892,480		
1991											
Winter	Jan	18.17	685	12,446	Winter	Jan	73.7	1295	95,442		
	Feb	18.17	1376	25,002		Feb	73.7	1126	82,986		
	total		2061	37,448				2421	178,428	215,876	
Spring	Mar	12.18	654	7,966	Spring	Mar	81.45	629	51,232		
	Apr	12.18	183	2,229		Apr	81.45	428	34,861		
	May	12.18	30	365		May	81.45	250	20,363		
	total		867	10,560		Total		1307	106,455	117,015	
	Dec	6.69	235	1,572		Dec	44.7	335	14,975	16,547	
Annual Total		3163	49,581				4063	299,857	349,438		

Table 8. Discard rate (lbs/trip), number of trips and total discards (lbs) of American plaice in the Northern Shrimp
cont'd fishery for Area 1 (N of 43°15' latitude) and Area 2 (S of 43°15' latitude), 1993-1997.

		AREA 1 (N > 43°15' latitude)				AREA 2 (S <= 43°15' latitude)					
Year	Month	Disc. Rat lbs / trip	No. Trips	Total Disc. (lbs)		Year	Month	Disc. Rat lbs / trip	No. Trips	Total Disc. (lbs)	Total Disc. (lbs)
1992											
Winter	Jan	6.69	2366	15,819		Winter	Jan	44.70	0	0	
	Feb	6.69	2269	15,170			Feb	44.70	378	16,897	
	total		4635	30,989					378	16,897	47,886
Spring	Mar	5.47	822	4,500		Spring	Mar	22.20	424	9,412	
	Apr	5.47	137	750			Apr	22.20	183	4,062	
	May	5.47	10	55			May	22.20	148	3,285	
	total		969	5,304			Total		755	16,759	22,064
	Dec	5.47	129	706		Dec		14.88	252	3,750	4,456
Annual Total			5733	37,000				1385	37,406		74,406
1993											
Winter	Jan	5.47	901	4,932		Winter	Jan	14.88	550	8,184	
	Feb	5.47	1382	7,565			Feb	14.88	714	10,624	
	total		2283	12,497					1264	18,808	31,305
Spring	Mar	4.48	526	2,357		Spring	Mar	16.44	784	12,893	
	Apr	4.48	111	497			Apr	16.44	386	6,348	
	May	4.48	0	0			May	16.44	5	82	
	total		637	2,855			Total		1175	19,322	22,177
	Dec	3.67	173	635		Dec		12.18	329	4,008	4,643
Annual Total			3093	15,987				2768	42,138		58,125
1994											
Winter	Jan	3.67	893	3,277		Winter	Jan	12.18	773	9,417	
	Feb	3.67	1243	4,561			Feb	12.18	1047	12,755	
	total		2136	7,838					1820	22,172	30,010
Spring	Mar	4.95	561	2,779		Spring	Mar	3.67	629	2,308	
	Apr	4.95	38	188			Apr	3.67	112	411	
	May	4.95	0	0			May	3.67	0	0	
	total		599	2,967			Total		741	2,719	5,686
	Dec	24.53	271	6,648		Dec		7.38	1633	12,052	18,699
Annual Total			3006	17,452				4194	36,943		54,395

Table 8. Discard rate (lbs/trip), number of trips and total discards (lbs) of American plaice in the Northern Shrimp
cont'd fishery for Area 1 (N of 43°15' latitude) and Area 2 (S of 43°15' latitude), 1993-1997.

		AREA 1 (N > 43°15' latitude)			AREA 2 (S <= 43°15' latitude)					
Year	Month	Disc. Rat lbs / trip	No. Trips	Total Disc. (lbs)	Year	Month	Disc. Rat lbs / trip	No. Trips	Total Disc. (lbs)	Total Disc. (lbs)
1995										
Winter	Jan	24.53	276	6,770	Winter	Jan	7.38	2508	18,509	
	Feb	24.53	480	11,774		Feb	7.38	2343	17,291	
	total		756	18,545				4851	35,800	54,345
Spring	Mar	14.89	146	2,174	Spring	Mar	54.60	1566	85,504	
	Apr	14.89	21	313		Apr	54.60	1076	58,750	
	May	14.89	0	0		May	54.60	0	0	
	total		167	2,487		Total		2642	144,253	146,740
	Dec	9.03	132	1,192	Dec		24.53	1726	42,339	43,531
Annual Total		1055	22,223				9219	222,392	244,616	
1996										
Winter	Jan	9.03	227	2,050	Winter	Jan	24.53	2329	57,130	
	Feb	9.03	621	5,608		Feb	24.53	3493	85,683	
	total		848	7,657				5822	142,814	150,471
Spring	Mar	81.45	323	26,308	Spring	Mar	27.11	1721	46,656	
	Apr	81.45	31	2,525		Apr	27.11	709	19,221	
	May	81.45	12	977		May	27.11	594	16,103	
	total		366	29,811		Total		3024	81,981	111,791
	Dec	7.39	113	835	Dec		18.17	2178	39,574	40,409
Annual Total		1327	38,303				11024	264,369	302,672	
1997										
Winter	Jan	7.39	208	1,537	Winter	Jan	18.17	2077	37,739	
	Feb	7.39	319	2,357		Feb	18.17	3085	56,054	
	total		527	3,895				5162	93,794	97,688
Spring	Mar	81.45	72	5,864	Spring	Mar	29.96	1631	48,865	
	Apr	81.45	42	3,421		Apr	29.96	1703	51,022	
	May	81.45	25	2,036		May	29.96	1238	37,090	
	total		139	11,322		Total		4572	136,977	148,299
	Dec	7.39	28	207	Dec		18.17	1196	21,731	21,938
Annual Total		694	15423				10930	252502	267,925	

Table 9. Discards at age (thousands of fish; metric tons) and mean weight (kg) at age of American plaice discarded in the northern shrimp fishery in the Gulf of Maine region, 1980-1997.

Year	Age											Total
	0	1	2	3	4	5	6	7	8	9	10	
Discards in Numbers (000's) at Age												Total
1980	0.0	5.6	84.5	105.4	79.9	19.9	0.0	0.0	0.0	0.0	0.0	295.4
1981	0.0	34.9	169.3	226.2	114.3	30.6	3.1	2.9	1.9	0.0	0.0	583.0
1982	0.0	55.9	310.4	244.2	326.3	33.5	33.6	0.0	0.0	0.0	0.0	1003.9
1983	0.1	15.1	427.8	399.1	449.9	178.2	22.5	1.1	0.0	0.0	0.0	1493.7
1984	0.7	50.3	214.8	308.0	297.1	88.6	29.1	0.0	0.0	0.0	0.0	988.6
1985	0.1	48.9	304.2	358.9	200.5	78.1	28.6	0.2	0.0	0.0	0.0	1019.5
1986	0.1	116.6	265.7	442.9	146.0	38.0	0.6	0.0	0.0	0.0	0.0	1010.0
1987	0.3	94.0	461.5	441.4	296.4	67.0	4.2	0.0	0.0	0.0	0.0	1364.9
1988	0.0	141.7	426.3	323.7	130.9	17.9	4.9	0.0	0.0	0.0	0.0	1045.4
1989	0.0	129.0	1458.3	1180.6	325.7	24.1	0.8	0.0	0.0	0.0	0.0	3118.4
1990	0.0	61.0	597.9	1965.4	1004.4	151.6	8.9	0.0	0.0	0.0	0.0	3789.2
1991	0.0	7.5	191.3	436.2	467.3	92.4	2.8	1.1	0.0	0.0	0.0	1198.7
1992	0.0	20.0	68.8	173.4	79.6	24.7	1.5	0.3	0.3	0.0	0.0	368.5
1993	0.0	81.9	95.8	113.2	85.2	22.7	4.3	0.0	0.0	0.2	0.0	403.4
1994	0.7	288.2	475.7	123.3	19.9	5.8	1.5	0.5	0.0	0.0	0.0	915.6
1995	1.1	518.3	1470.5	717.3	96.7	11.9	4.6	0.2	0.6	0.0	0.0	2821.1
1996	0.0	194.7	834.5	1041.0	359.3	53.4	19.9	6.9	0.1	0.0	0.0	2509.8
1997	0.0	158.0	1365.4	511.5	358.7	85.6	14.6	0.7	0.0	0.0	0.0	2494.5
Discards at age (mt)												Total
1980	0.0	0.1	2.8	6.9	10.3	4.3	0.0	0.0	0.0	0.0	0.0	24.4
1981	0.0	0.5	5.6	14.9	14.7	6.7	0.9	1.0	0.6	0.0	0.0	44.7
1982	0.0	0.8	10.3	16.1	41.9	7.3	9.3	0.0	0.0	0.0	0.0	85.7
1983	0.0	0.2	14.2	26.2	57.8	38.8	6.2	0.4	0.0	0.0	0.0	143.8
1984	0.0	0.8	7.1	20.3	38.2	19.3	8.0	0.0	0.0	0.0	0.0	93.6
1985	0.0	0.7	10.1	23.6	25.7	17.0	7.9	0.1	0.0	0.0	0.0	85.1
1986	0.0	1.7	8.8	29.1	18.8	8.3	0.2	0.0	0.0	0.0	0.0	66.9
1987	0.0	1.4	15.3	29.0	38.1	14.6	1.2	0.0	0.0	0.0	0.0	99.5
1988	0.0	2.1	14.1	21.3	16.8	3.9	1.4	0.0	0.0	0.0	0.0	59.6
1989	0.0	1.6	55.5	124.8	51.1	5.5	0.2	0.0	0.0	0.0	0.0	238.6
1990	0.0	1.3	34.0	168.8	143.8	29.7	2.4	0.0	0.0	0.0	0.0	380.0
1991	0.0	0.1	8.8	39.5	75.4	24.6	1.0	0.4	0.0	0.0	0.0	149.8
1992	0.0	0.4	2.1	10.8	11.8	6.0	0.4	0.1	0.1	0.0	0.0	31.7
1993	0.0	1.3	3.6	4.9	8.5	5.0	1.2	0.0	0.0	0.1	0.0	24.6
1994	0.0	4.1	10.1	5.6	1.9	1.2	0.4	0.2	0.0	0.0	0.0	23.4
1995	0.0	6.4	37.5	40.1	13.0	3.0	1.2	0.1	0.2	0.0	0.0	101.4
1996	0.0	2.7	18.4	49.1	39.6	11.1	5.3	1.8	0.1	0.0	0.0	128.0
1997	0.0	2.1	27.5	28.6	38.2	12.4	2.8	0.3	0.0	0.0	0.0	111.9
Mean weight at age (kg)												Average
1980	—	0.015	0.033	0.066	0.128	0.217	0.277	0.342	0.296	0.239	—	0.083
1981	—	0.015	0.033	0.066	0.128	0.217	0.277	0.342	0.296	0.239	—	0.077
1982	—	0.015	0.033	0.066	0.128	0.217	0.277	0.342	0.296	0.239	—	0.085
1983	0.001	0.015	0.033	0.066	0.128	0.217	0.277	0.342	0.296	0.239	—	0.096
1984	0.001	0.015	0.033	0.066	0.128	0.217	0.277	0.342	0.296	0.239	—	0.095
1985	0.001	0.015	0.033	0.066	0.128	0.217	0.277	0.342	0.296	0.239	—	0.084
1986	0.001	0.015	0.033	0.066	0.128	0.217	0.277	0.342	0.296	0.239	—	0.066
1987	0.001	0.015	0.033	0.066	0.128	0.217	0.277	0.342	0.296	0.239	—	0.073
1988	—	0.015	0.033	0.066	0.128	0.217	0.277	0.342	0.296	0.239	—	0.057
1989	—	0.012	0.038	0.106	0.157	0.227	0.313	—	—	—	—	0.077
1990	—	0.021	0.057	0.086	0.143	0.196	0.265	—	—	—	—	0.100
1991	—	0.013	0.046	0.091	0.161	0.266	0.370	0.359	0.000	—	—	0.125
1992	—	0.018	0.031	0.062	0.149	0.241	0.299	0.359	0.239	—	—	0.086
1993	—	0.016	0.037	0.044	0.100	0.221	0.278	—	0.000	0.239	—	0.061
1994	0.001	0.014	0.021	0.045	0.095	0.205	0.240	0.359	—	0.000	—	0.026
1995	0.001	0.012	0.026	0.056	0.134	0.248	0.266	0.359	0.289	0.000	—	0.036
1996	0.000	0.014	0.022	0.047	0.110	0.208	0.267	0.256	0.359	0.000	—	0.051
1997	0.000	0.014	0.020	0.056	0.107	0.145	0.191	0.361	—	0.000	—	0.045

*Mean weights at age from 1980-1988 calculated as averages of 1989-1997.

Table 10. The percent of total American plaice landings caught by large mesh otter trawl gear (5.0", 5.1", and 6.0" mesh), 1980-1997.

Year	Mesh(inches)	Percent of total landings
1980	5.0	55.5
1981	5.0	63.2
1982	5.0	85.4
1983	5.5	62.3
1984	5.5	80.5
1985	5.5	84.9
1986	5.5	90.8
1987	5.5	97.8
1988	5.5	98.3
1989	5.5	95.6
1990	5.5	97.3
1991	5.5	95.7
1992	5.5	93.7
1993	5.5	91.7
1994	6.0	89.2
1995	6.0	88.4
1996	6.0	90.2
1997	6.0	88.3

Table 11 Discards at age (thousands of fish; metric tons) and mean weight (kg) at age of American plaice discarded in the large mesh otter trawl fishery in the Gulf of Maine-Georges Bank region, 1980-1997.

Year	Age											Total
	0	1	2	3	4	5	6	7	8	9	10	
Discards in Numbers (000's) at Age												
1980	0.0	5.2	98.9	935.7	1786.7	781.2	30.2	2.9	0.0	0.0	0.0	3640.8
1981	0.0	4.2	246.7	495.9	436.9	157.6	29.8	19.9	5.4	0.0	0.0	1396.4
1982	0.0	2.7	335.4	668.9	446.8	101.8	21.7	0.0	0.0	0.0	0.0	1577.3
1983	0.0	0.6	47.8	399.5	681.4	327.8	52.6	12.2	1.4	3.4	0.0	1526.6
1984	0.0	0.0	65.0	249.1	549.4	718.1	281.5	16.3	0.3	0.0	0.0	1879.8
1985	0.0	10.9	54.6	227.0	85.8	30.8	5.6	0.0	0.0	0.0	0.0	414.5
1986	0.0	5.6	85.9	139.6	268.3	65.7	4.4	0.1	0.0	0.0	0.0	569.6
1987	0.0	7.1	135.9	390.4	343.7	241.1	53.2	3.8	1.9	0.0	0.0	1177.1
1988	0.0	30.4	197.1	606.9	276.6	50.3	5.7	0.2	0.0	0.0	0.0	1167.0
1989	0.0	3.4	194.6	574.8	347.7	119.2	31.5	4.0	1.1	0.0	0.0	1276.3
1990	0.0	6.9	77.9	1221.4	814.0	168.3	22.1	1.0	0.1	0.0	0.0	2311.7
1991	0.0	5.6	132.1	541.9	2092.5	492.0	14.8	0.8	0.0	0.0	0.0	3279.7
1992	0.0	17.3	162.1	863.4	1403.5	1913.9	160.3	6.3	7.3	0.0	0.0	4533.9
1993	0.0	24.9	330.1	1795.9	3027.9	1523.5	683.4	20.9	0.0	0.0	0.0	7406.5
1994	0.0	0.0	6.9	299.6	1693.0	2550.8	414.3	110.4	0.0	0.5	0.0	5075.5
1995	0.0	0.0	17.6	1426.0	5689.0	1933.9	251.5	7.2	1.0	0.0	0.0	9326.3
1996	0.0	0.0	0.7	201.8	1568.8	508.8	38.9	8.7	8.8	0.0	0.0	2336.6
1997	0.0	0.0	9.7	289.5	1104.8	1219.2	128.2	97.0	45.6	42.5	21.9	2958.5
Discards at age (mt)												
1980	0.0	0.2	7.5	147.2	423.8	218.3	9.4	1.1	0.0	0.0	0.0	807.6
1981	0.0	0.2	21.9	61.7	70.0	26.7	5.6	3.4	1.1	0.0	0.0	190.6
1982	0.0	0.1	42.1	98.8	69.3	18.6	3.8	0.0	0.0	0.0	0.0	232.6
1983	0.0	0.0	4.0	65.8	134.5	69.7	12.0	2.8	0.4	0.8	0.0	290.0
1984	0.0	0.0	6.7	40.2	112.4	172.8	71.3	5.2	0.1	0.0	0.0	408.7
1985	0.0	0.3	4.8	25.4	11.3	4.8	0.9	0.0	0.0	0.0	0.0	47.6
1986	0.0	0.2	6.2	17.9	44.7	12.4	0.7	0.0	0.0	0.0	0.0	82.2
1987	0.0	0.1	11.4	60.2	69.5	59.2	15.2	1.1	0.2	0.0	0.0	216.9
1988	0.0	0.6	13.5	100.1	53.5	11.3	1.5	0.1	0.0	0.0	0.0	180.5
1989	0.0	0.1	12.8	96.5	81.0	29.2	7.5	0.8	0.4	0.0	0.0	228.2
1990	0.0	0.1	5.2	222.8	207.9	45.5	6.6	0.4	0.0	0.0	0.0	488.4
1991	0.0	0.1	8.4	73.1	543.5	139.9	6.0	0.4	0.0	0.0	0.0	771.4
1992	0.0	0.7	12.8	139.9	375.4	674.6	60.0	1.8	1.7	0.0	0.0	1267.0
1993	0.0	0.4	29.5	374.4	787.5	496.6	259.9	7.7	0.0	0.0	0.0	1956.1
1994	0.0	0.0	0.7	67.4	470.7	856.4	153.7	45.8	0.0	0.3	0.0	1595.0
1995	0.0	0.0	2.7	373.2	1776.5	693.5	95.5	3.5	0.3	0.0	0.0	2945.3
1996	0.0	0.0	0.1	47.1	446.6	156.2	13.6	3.2	3.2	0.0	0.0	669.9
1997	0.0	0.0	1.7	59.9	285.8	319.5	36.0	25.2	10.9	12.5	6.5	758.0
Mean weight at age (kg)												
1980	—	0.030	0.076	0.157	0.237	0.279	0.311	0.392	0.000	—	—	0.222
1981	—	0.037	0.089	0.124	0.160	0.169	0.189	0.171	0.209	—	—	0.133
1982	—	0.029	0.126	0.148	0.155	0.182	0.173	—	—	—	—	0.147
1983	0.007	0.024	0.083	0.165	0.197	0.213	0.228	0.234	0.308	0.229	—	0.190
1984	—	0.103	0.162	0.205	0.241	0.253	0.317	0.432	—	—	—	0.217
1985	—	0.030	0.088	0.112	0.132	0.155	0.168	0.000	0.000	—	—	0.115
1986	—	0.035	0.072	0.128	0.167	0.189	0.171	0.295	—	—	—	0.144
1987	—	0.020	0.084	0.154	0.202	0.246	0.286	0.295	0.116	—	—	0.184
1988	—	0.019	0.068	0.165	0.193	0.226	0.262	0.359	—	—	—	0.155
1989	—	0.017	0.066	0.168	0.233	0.245	0.239	0.209	0.369	—	—	0.179
1990	—	0.015	0.067	0.182	0.255	0.270	0.300	0.359	0.432	—	—	0.211
1991	—	0.019	0.063	0.135	0.260	0.284	0.406	0.515	—	—	—	0.235
1992	—	0.039	0.079	0.162	0.267	0.353	0.374	0.290	0.239	—	—	0.279
1993	—	0.017	0.090	0.208	0.260	0.326	0.380	0.371	—	—	—	0.264
1994	—	0.047	0.102	0.225	0.278	0.336	0.371	0.415	—	0.609	—	0.314
1995	—	—	0.156	0.262	0.312	0.359	0.380	0.489	0.295	0.000	—	0.316
1996	—	0.065	0.101	0.233	0.285	0.307	0.349	0.366	0.359	0.000	—	0.287
1997	—	0.065	0.170	0.207	0.259	0.262	0.281	0.260	0.239	0.295	0.295	0.256

Table 12 Catch at age (thousands of fish; metric tons) and mean weight (kg), of commercial landings, and large mesh and northern shrimp fishery discards of American plaice from Gulf of Maine - Georges Bank, and South, 1980-1997.

Year	Age															Total
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	
Catch in Numbers (000's) at Age																
1980	0	11	183	1063	2636	3930	3933	3632	1185	1139	850	323	155	215	687	19943
1981	0	39	1003	2054	4882	5288	3651	2404	1581	645	440	196	146	45	234	22607
1982	0	59	759	3047	4268	4431	3536	3293	2038	1256	737	317	34	137	230	24140
1983	0	16	476	1236	4866	4776	3884	2265	1272	701	450	455	230	59	168	20854
1984	1	50	283	810	2144	5625	3175	1930	577	274	307	65	57	0	647	15946
1985	0	60	359	645	1072	2175	2822	2214	1081	438	267	79	54	19	30	11315
1986	0	122	352	781	1497	1606	1467	1307	631	255	105	51	26	7	15	8224
1987	0	101	612	1174	1126	2011	1328	894	543	187	62	26	15	14	5	8099
1988	0	172	624	1377	1556	1524	1438	543	270	177	88	25	13	11	6	7825
1989	0	132	1653	1831	1125	829	536	753	471	193	103	35	29	22	31	7740
1990	0	68	676	3389	2664	1369	531	291	349	193	96	74	42	16	29	9787
1991	0	13	323	1001	4410	3403	1123	321	164	201	97	66	23	9	6	11161
1992	0	37	231	1083	2222	6810	2724	819	198	131	118	38	33	18	4	14467
1993	0	107	426	2032	4141	3583	3139	1403	265	287	151	71	22	7	25	15658
1994	1	288	506	623	2627	4459	1703	1288	608	240	153	64	49	26	157	12791
1995	1	518	1488	2285	6503	4826	2001	654	584	212	53	26	16	0	8	19175
1996	0	195	936	1418	4443	2958	1471	549	250	125	35	21	15	22	5	12444
1997	0	158	1375	803	2739	3919	1701	718	230	128	89	48	19	11	41	11978
Catch at Age (mt)																
1980	0	0	10	160	705	1609	2571	3009	1232	1347	1168	508	269	391	1448	14429
1981	0	1	106	353	1570	2351	2838	2126	1547	729	552	266	257	82	358	13134
1982	0	1	75	735	1277	1870	2020	3164	2320	1502	1144	551	65	224	524	15471
1983	0	1	16	179	1781	2527	2608	1872	1334	876	660	649	417	121	394	13436
1984	0	1	14	144	700	3105	2037	1719	688	310	421	134	93	0	1279	10644
1985	0	1	15	62	249	769	1525	1884	1263	603	445	158	115	42	73	7203
1986	0	2	15	100	412	637	865	1101	741	380	183	102	58	17	42	4655
1987	0	2	30	187	295	883	813	798	637	278	107	56	34	32	15	4165
1988	0	3	28	247	483	705	925	484	333	247	151	49	29	26	20	3730
1989	0	2	68	247	309	370	303	554	403	257	150	62	51	46	66	2888
1990	0	1	39	469	707	623	339	240	338	210	125	104	76	30	62	3364
1991	0	0	17	120	1458	1696	797	308	191	256	150	107	46	18	17	5182
1992	0	1	15	173	701	3304	1956	776	238	173	193	72	63	40	13	7717
1993	0	2	33	430	1259	1556	1852	1313	327	399	238	126	55	13	94	7699
1994	0	4	14	121	863	1866	961	984	659	309	217	106	92	54	466	6715
1995	0	6	40	464	2091	2178	1238	534	653	283	112	51	28	0	17	7695
1996	0	3	35	155	1503	1403	937	495	294	172	55	41	33	57	13	5196
1997	0	2	29	89	865	1577	1030	536	219	127	112	82	40	32	131	4872

Table 12 (continued). Catch at age (thousands of fish; metric tons) and mean weight (kg), of commercial landings, and large mesh and northern shrimp fishery discards of American plaice from Gulf of Maine - Georges Bank, and South, 1980-1997.

Year	Age															Average
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	
Mean Weight at Age (kg)																
1980	---	0.022	0.056	0.151	0.267	0.409	0.653	0.829	1.039	1.183	1.374	1.573	1.732	1.815	2.109	0.723
1981	---	0.017	0.105	0.172	0.322	0.444	0.778	0.884	0.979	1.130	1.254	1.354	1.755	1.836	1.534	0.581
1982	---	0.016	0.099	0.241	0.300	0.422	0.572	0.961	1.138	1.196	1.552	1.737	1.944	1.636	2.281	0.641
1983	0.002	0.015	0.038	0.195	0.393	0.543	0.674	0.825	1.042	1.239	1.446	1.404	1.762	1.843	2.255	0.653
1984	0.001	0.015	0.051	0.178	0.326	0.552	0.641	0.890	1.192	1.133	1.369	2.058	1.628	2.014	1.977	0.667
1985	0.001	0.018	0.041	0.096	0.232	0.354	0.540	0.852	1.167	1.377	1.665	1.991	2.115	2.254	2.437	0.637
1986	0.001	0.016	0.043	0.128	0.276	0.397	0.589	0.842	1.174	1.491	1.747	2.002	2.207	2.344	2.751	0.566
1987	0.001	0.015	0.048	0.159	0.262	0.439	0.612	0.893	1.173	1.483	1.732	2.148	2.213	2.359	2.988	0.514
1988	---	0.016	0.044	0.180	0.311	0.462	0.643	0.892	1.231	1.396	1.717	1.991	2.265	2.278	3.074	0.477
1989	---	0.012	0.041	0.135	0.275	0.446	0.566	0.736	0.857	1.334	1.463	1.789	1.780	2.106	2.142	0.373
1990	---	0.021	0.058	0.138	0.265	0.455	0.639	0.824	0.968	1.089	1.305	1.409	1.811	1.881	2.154	0.344
1991	---	0.015	0.053	0.120	0.330	0.498	0.710	0.960	1.161	1.276	1.541	1.618	2.012	2.050	2.837	0.464
1992	---	0.028	0.065	0.159	0.315	0.485	0.717	0.948	1.202	1.319	1.640	1.902	1.928	2.151	2.884	0.533
1993	---	0.016	0.078	0.212	0.304	0.434	0.590	0.936	1.234	1.393	1.577	1.784	2.468	1.989	3.750	0.492
1994	0.001	0.014	0.028	0.194	0.328	0.418	0.564	0.763	1.083	1.287	1.424	1.657	1.880	2.082	2.963	0.525
1995	0.001	0.012	0.027	0.203	0.322	0.453	0.646	0.909	1.166	1.099	2.105	1.934	1.757	0.000	2.213	0.407
1996	---	0.014	0.038	0.110	0.338	0.474	0.637	0.902	1.172	1.383	1.565	1.962	2.127	2.525	2.486	0.418
1997	---	0.014	0.021	0.111	0.316	0.402	0.605	0.746	0.951	0.992	1.256	1.709	2.138	3.084	3.231	0.407

Table 13. USA commercial landings (L, mt), days fished (DF), and landings per day fished (L/DF), by vessel tonnage class (class 2: 5-50 GRT; class 4: 151-500 GRT), of American plaice for otter trawl trips landing plaice from the Gulf of Maine-Georges Bank area, 1964-1997. Data are also provided for otter trawl trips in which plaice comprised 50% or more of the total trip catch, by weight ['directed trips'], 1964-1997.

YEAR	TON CLASS 2			TON CLASS 3			TON CLASS 4			TOTAL		
	L	DF	L/DF	L	DF	L/DF	L	DF	L/DF	L	DF	L/DF
ALL TRIPS												
1964	729.7	2207.5	0.33	1640.3	6016.4	0.27	157.1	1370.4	0.11	2527.1	9594.3	0.28
1965	898.5	2333.1	0.39	1591.4	6052.1	0.26	274.3	1754.9	0.16	2764.2	10140.1	0.29
1966	871.4	2221.7	0.39	1816.1	6664.4	0.27	421.3	2828.9	0.15	3108.8	10140.1	0.29
1967	787.1	1883.1	0.42	2026.8	6016.0	0.34	283.3	2121.2	0.13	3097.2	10020.3	0.34
1968	603.3	2277.7	0.26	1711.4	5640.2	0.30	232.9	1954.4	0.12	2547.6	9872.3	0.27
1969	783.9	2434.4	0.32	1681.5	5761.4	0.29	303.6	1640.0	0.19	2769.0	9835.8	0.29
1970	634.7	3690.0	0.17	1556.3	5783.9	0.27	281.9	1505.5	0.19	2472.9	10979.4	0.24
1971	484.1	2989.1	0.16	1442.0	5823.2	0.25	215.6	1176.6	0.18	2141.7	9988.9	0.22
1972	389.4	2972.9	0.13	1252.0	6806.6	0.18	135.0	1120.7	0.12	1776.4	10900.2	0.16
1973	466.0	2703.0	0.17	931.1	5675.7	0.16	161.7	1056.9	0.15	1558.8	9435.6	0.16
1974	687.3	3161.3	0.22	1053.0	5766.4	0.18	192.8	1310.3	0.15	1933.1	10238.0	0.19
1975	1076.6	3733.5	0.29	992.3	5868.2	0.17	227.3	1393.8	0.16	2296.2	10995.5	0.23
1976	1715.4	3680.3	0.47	1421.4	5776.2	0.25	184.3	1334.0	0.14	3321.1	10790.5	0.36
1977	3667.4	3805.7	0.96	2577.5	6862.8	0.38	354.3	1358.6	0.26	6599.2	12027.1	0.70
1978	4494.9	4648.2	0.97	3862.5	8187.4	0.47	513.8	1769.1	0.29	8871.2	14604.7	0.71
1979	4942.8	5264.5	0.94	4553.0	8549.1	0.53	639.4	2313.9	0.28	10135.2	16127.5	0.71
1980	5909.9	5900.6	1.00	4749.0	8784.4	0.54	1042.6	2832.0	0.37	11701.5	17517.0	0.76
1981	5779.1	4935.6	1.17	5153.3	8847.7	0.58	1167.4	3307.4	0.35	12099.8	17090.7	0.84
1982	5782.7	5929.6	0.98	6437.3	10602.2	0.61	1808.5	4425.2	0.41	14028.5	20957.0	0.74
1983	4472.8	5312.0	0.84	5738.0	10378.2	0.55	2131.4	4960.8	0.43	12342.2	20651.0	0.63
1984	3097.5	5285.0	0.59	4723.9	12641.8	0.37	1753.6	5164.8	0.34	9575.0	23091.6	0.44
1985	1858.9	4704.0	0.40	3259.9	13665.9	0.24	1546.4	6092.7	0.25	6665.2	24462.6	0.29
1986	1168.1	4385.6	0.27	1971.3	11202.2	0.18	969.1	5806.7	0.17	4108.5	21394.5	0.20
1987	919.6	4485.8	0.21	1816.8	10943.8	0.17	826.8	5567.0	0.15	3563.2	20996.6	0.18
1988	899.1	4709.4	0.19	1539.0	10711.6	0.14	635.5	5500.3	0.12	3073.6	20921.3	0.15
1989	574.9	3794.6	0.15	1158.7	9218.6	0.13	438.4	4669.8	0.09	2172.0	17683.0	0.13
1990	696.2	4060.5	0.17	1145.5	8788.5	0.13	412.7	5063.1	0.08	2254.4	17912.1	0.13
1991	973.6	4299.5	0.23	2236.2	10370.2	0.22	749.0	5653.8	0.13	3958.8	20323.5	0.21
1992	1481.0	4561.3	0.32	3545.1	13565.9	0.26	1169.9	6292.3	0.19	6196.0	24419.5	0.26
1993	1176.7	3688.7	0.32	3066.3	13872.1	0.22	1073.4	6059.5	0.18	5316.4	23620.3	0.23
1994	712.1	2458.5	0.29	1674.3	6823.4	0.25	814.8	3419.4	0.24	3201.2	12701.3	0.25
1995	887.0	3046.9	0.29	1814.6	8064.3	0.23	695.7	3928.7	0.18	3397.3	15040.0	0.23
1996	860.6	3115.2	0.28	2033.3	8361.8	0.24	721.5	3415.0	0.21	3615.5	14892.0	0.24
1997	814.7	3017.9	0.27	1647.6	6070.5	0.27	664.8	2615.0	0.25	3127.1	11703.3	0.27

Table 13 (continued). USA commercial landings (L, mt), days fished (DF), and landings per day fished (L/DF), by vessel tonnage class (class 2: 5-50 GRT; class 4: 151-500 GRT), of American plaice for otter trawl trips landing plaice from the Gulf of Maine-Georges Bank area, 1964-1997. Data are also provided for otter trawl trips in which plaice comprised 50% or more of the total trip catch, by weight ['directed trips'], 1964-1997.

YEAR	TON CLASS 1			TON CLASS 3			TON CLASS 4			TOTAL		
	L	DF	L/DF	L	DF	L/DF	L	DF	L/DF	L	DF	L/DF
50% TRIPS												
1964	201.6	115.8	1.74	429.6	166.9	2.57	0.0	0.0	0.00	631.2	282.7	2.30
1965	268.5	161.7	1.66	413.8	180.5	2.29	3.8	2.0	1.91	686.1	344.2	2.04
1966	218.6	133.9	1.63	527.3	249.9	2.11	1.2	1.5	0.82	747.1	385.3	1.97
1967	155.2	78.7	1.97	685.6	365.5	1.88	15.8	6.0	2.64	856.6	450.2	1.91
1968	55.0	30.5	1.80	557.9	291.6	1.91	3.9	2.0	1.93	616.8	324.1	1.90
1969	135.6	61.0	2.22	320.9	154.8	2.07	0.7	1.0	0.68	457.2	216.8	2.11
1970	10.0	9.2	1.09	309.6	143.6	2.16	31.2	14.6	2.14	350.8	167.4	2.13
1971	3.5	3.6	0.98	147.7	1.6	2.06	20.7	6.3	3.28	171.9	81.5	2.18
1972	8.6	7.5	1.15	92.8	2.5	1.28	1.1	2.4	0.45	102.5	82.4	1.26
1973	17.3	23.1	0.75	70.6	42.2	1.67	6.5	3.0	2.16	94.4	68.3	1.54
1974	110.0	99.2	1.11	142.3	3.4	1.52	10.2	8.5	1.20	262.5	201.1	1.34
1975	158.5	119.3	1.33	103.2	70.4	1.47	20.8	15.7	1.32	282.5	205.4	1.38
1976	496.9	371.6	1.34	184.2	101.6	1.81	3.8	5.0	0.75	684.9	478.2	1.46
1977	1516.3	570.0	2.66	520.8	203.5	2.56	12.9	7.4	1.74	2050.0	780.9	2.63
1978	981.1	806.1	2.46	721.1	273.5	2.64	6.6	5.0	1.32	2708.8	1084.6	2.51
1979	2865.8	1418.6	2.02	1219.3	435.8	2.80	14.5	9.2	1.58	4099.6	1863.6	2.25
1980	3083.4	1499.5	2.06	1188.3	443.2	2.68	57.0	19.0	3.00	4328.7	1961.7	2.24
1981	3391.9	1416.5	2.39	1651.0	585.7	2.82	69.3	22.1	3.13	5112.2	2024.3	2.54
1982	3276.6	1838.5	1.78	2078.2	976.9	2.13	132.2	60.3	2.19	5487.0	2875.7	1.92
1983	2087.0	1248.1	1.67	1344.2	761.9	1.76	105.5	58.2	1.81	3536.7	2068.2	1.71
1984	1189.8	964.1	1.23	707.7	539.9	1.31	108.1	58.0	1.86	2005.6	1562.0	1.29
1985	538.4	567.2	0.95	226.0	255.2	0.89	46.5	52.1	0.89	810.9	874.5	0.93
1986	179.4	237.7	0.75	112.7	166.3	0.68	33.3	33.9	0.98	325.4	437.9	0.75
1987	178.5	244.3	0.73	126.1	251.3	0.50	17.4	31.3	0.56	322.0	526.9	0.63
1988	149.2	298.3	0.50	212.0	401.1	0.53	4.0	8.8	0.46	365.2	708.2	0.52
1989	80.4	136.3	0.59	31.7	48.4	0.66	2.4	2.5	0.97	114.5	187.2	0.62
1990	111.8	192.0	0.58	138.0	210.2	0.66	0.0	0.0	0.00	249.8	402.2	0.62
1991	277.7	365.3	0.76	529.7	812.9	0.65	26.7	33.7	0.79	834.1	1211.9	0.69
1992	560.7	796.2	0.70	1131.3	1579.1	0.72	75.9	93.4	0.81	1767.9	2468.7	0.72
1993	467.9	809.3	0.58	628.8	968.8	0.65	31.2	52.0	0.60	1127.9	1830.1	0.62
1994	399.7	824.7	0.48	533.7	991.7	0.54	50.1	60.0	0.84	983.4	1876.4	0.53
1995	520.9	1099.0	0.47	533.2	1043.8	0.51	51.4	106.8	0.48	1105.5	2249.6	0.49
1996	422.8	873.6	0.48	548.1	891.5	0.61	26.7	45.0	0.59	997.6	1810.1	0.56
1997	333.4	643.3	0.52	266.5	385.8	0.69	9.7	17.2	0.56	609.6	1046.3	0.59

Table 14. USA commercial landings (mt), days fished, and landings per day fished, by vessel tonnage class (class 2: 5-50 GRT; class 4: 151-500 GRT), of American plaice for otter trawl trips landing plaice from the Gulf of Maine-Georges Bank area, by quarter, 1994-1997.

Year	Landings				Days Fished				Landings / Day Fished						
	TC	Q1	Q2	Q3	Q4	TC	Q1	Q2	Q3	Q4	TC	Q1	Q2	Q3	Q4
1994	2	14.2	218.1	330.9	148.9	2	48.4	743.4	1103.6	563.1	2	0.29	0.29	0.30	0.26
	3	93.1	442.8	687.6	450.9	3	706.7	1975.6	2378.6	1767.5	3	0.13	0.22	0.29	0.26
	4	89.8	150.5	276.1	298.3	4	636.0	856.8	998.2	928.5	4	0.14	0.18	0.28	0.32
1995	2	32.5	488.8	263.8	101.9	2	259.2	1532.8	864.2	390.7	2	0.13	0.32	0.31	0.26
	3	237.0	662.9	631.0	283.7	3	1567.4	2588.8	2571.1	1337.1	3	0.15	0.26	0.25	0.21
	4	134.0	191.1	233.9	136.7	4	1059.1	1091.2	1143.2	635.1	4	0.13	0.18	0.20	0.22
1996	2	22.4	405.5	308.2	124.5	2	167.8	1403.0	1081.8	462.6	2	0.13	0.29	0.28	0.27
	3	227.3	659.7	726.1	420.3	3	1484.1	2719.0	2447.0	1711.7	3	0.15	0.24	0.30	0.25
	4	146.3	176.7	207.3	191.3	4	849.0	975.4	830.8	759.6	4	0.17	0.18	0.25	0.25
1997	2	22.2	335.5	325.1	132.0	2	149.2	1286.6	1057.8	524.4	2	0.15	0.26	0.31	0.25
	3	270.9	548.6	539.6	288.6	3	1357.0	1947.8	1658.3	1107.3	3	0.20	0.28	0.33	0.26
	4	168.3	221.8	147.3	127.5	4	824.0	739.8	538.7	512.5	4	0.20	0.30	0.27	0.25

Table 15. Stratified mean number and mean weight per tow (kg) of American plaice in NEFSC spring and autumn bottom trawl surveys, adjusted for vessel differences, in the Gulf of Maine - Georges Bank area, 1963-1997.

	SPRING		AUTUMN	
	Number	Weight	Number	Weight
1963	---	---	14.17	5.87
1964	---	---	8.20	2.84
1965	---	---	11.95	3.80
1966	---	---	17.78	4.90
1967	---	---	11.05	2.69
1968	11.36	3.40	8.61	2.91
1969	8.59	2.68	7.51	2.36
1970	5.43	1.81	6.46	2.01
1971	3.80	1.26	7.47	1.96
1972	4.28	1.32	7.44	1.60
1973	7.18	1.85	6.19	1.94
1974	8.34	1.94	6.89	1.42
1975	5.78	1.72	8.12	2.43
1976	11.85	3.37	9.98	2.99
1977	14.57	5.11	11.80	3.52
1978	10.61	3.82	15.13	4.66
1979	9.23	3.62	9.96	4.00
1980	18.34	4.78	14.24	5.12
1981	18.75	5.88	13.04	5.62
1982	11.61	3.80	5.88	2.49
1983	16.94	4.60	9.34	3.45
1984	4.10	1.42	7.12	2.02
1985	4.94	1.88	6.95	2.00
1986	3.09	0.92	5.61	1.56
1987	3.50	0.81	4.38	1.09
1988	3.58	0.84	9.69	1.46
1989	4.81	0.75	9.21	1.17
1990	5.09	0.75	15.46	2.90
1991	5.91	1.05	7.71	1.56
1992	4.11	1.36	6.31	1.78
1993	5.29	1.39	11.89	2.39
1994	4.89	0.85	18.07	2.67
1995	9.43	1.94	11.84	2.58
1996	7.83	1.69	7.58	2.23
1997	7.62	1.62	6.27	1.94
1998	4.52	1.11	----	----

Table 16. Results of preliminary formulations for VPA calibration of
Gulf of Maine - Georges Bank American plaice.

Run Number Ages Estimated	41-BASE 2 to 8	48 1 to 8
Indices used:		
US Spring	1 to 8	1 to 8
US Autumn	2 to 8	1 to 8
MA Spring	1 to 5	1 to 5
MA Autumn	2 to 6	1 to 6
Mean Square	0.36	0.41
CV on N	0.18 to 0.35	0.19 to 0.47
Stock Sizes:		
N1	0	12228
N2	6301	6933
N3	8660	8478
N4	7413	7995
N5	13123	12178
N6	12304	11660
Fishing Mortality		
F1	0.02	0.02
F2	0.13	0.14
F3	0.09	0.09
F4	0.17	0.19
F5	0.25	0.27
F6	0.49	0.53
Recruits:		
Year class 1992	56601	54850
Year class 1993	39386	37283
Year class 1994	16667	17727
Year class 1995	14990	14719
Year class 1996	7870	8643

Table 17. Estimates of beginning year stock size (thousands of fish), instantaneous fishing mortality (F), spawning stock biomass (mt) and percent female maturity of Gulf of Maine-Georges Bank American plaice, estimated from virtual population analysis (VPA) and calibrated using the commercial catch at age ADAPT formulation, 1980-1997.

Stock Numbers (Jan 1) in thousands		1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998
Age																				
1	50702	23856	20595	21754	12745	12305	17694	36417	52580	26390	32391	30720	35205	56601	39386	16667	14990	7870	0	
2	41263	41501	19497	16809	17796	10389	10020	14377	29724	42893	21487	26458	25139	28790	46244	31986	13177	12097	6301	
3	35738	33618	33071	15276	13331	14314	8181	7885	11217	23771	33622	16980	21370	20373	23186	37404	24842	9942	8660	
4	24117	28298	25665	24319	11388	10182	11136	5991	5394	7938	17806	24461	12997	16516	14842	18419	28556	19056	7413	
5	21641	17360	18751	17151	15508	7384	7366	7763	3887	3008	5481	12167	16037	8630	9775	9774	9196	19360	13123	
6	17355	14162	9428	11343	9721	7607	4077	4578	4536	1803	1713	3249	6883	6968	3824	3969	3636	4853	12304	
7	11140	10650	8291	4520	5772	5086	3675	2011	2546	2413	991	922	1644	3170	2865	1590	1439	1646	2434	
8	5135	5834	6545	3809	1651	2980	2160	1826	837	1593	1294	548	464	605	1326	1180	710	681	698	
9+	14503	6248	8628	6117	3825	2420	1562	1031	987	1379	1656	1333	792	1268	1481	627	630	983	854	
1 +	2E+05	2E+05	2E+05	1E+05	91738	72667	65873	81878	1E+05	97175	76486	51786								
Fishing Mortality		1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	
Age																				
1	0	0	0	0	0	0.01	0.01	0	0	0.01	0	0	0	0	0.01	0.03	0.01	0.02		
2	0	0.03	0.04	0.03	0.02	0.04	0.04	0.05	0.02	0.04	0.04	0.01	0.01	0.02	0.01	0.05	0.08	0.13		
3	0.03	0.07	0.11	0.09	0.07	0.05	0.11	0.18	0.15	0.09	0.12	0.07	0.06	0.12	0.03	0.07	0.07	0.09		
4	0.13	0.21	0.2	0.25	0.23	0.12	0.16	0.23	0.38	0.17	0.18	0.22	0.21	0.32	0.22	0.49	0.19	0.17		
5	0.22	0.41	0.3	0.37	0.51	0.39	0.28	0.34	0.57	0.36	0.32	0.37	0.63	0.61	0.7	0.79	0.44	0.25		
6	0.29	0.34	0.54	0.48	0.45	0.53	0.51	0.39	0.43	0.4	0.42	0.48	0.58	0.69	0.68	0.81	0.59	0.49		
7	0.45	0.29	0.58	0.81	0.46	0.66	0.5	0.68	0.27	0.42	0.39	0.49	0.8	0.67	0.69	0.61	0.55	0.66		
8	0.29	0.36	0.42	0.46	0.49	0.51	0.39	0.4	0.44	0.4	0.35	0.4	0.64	0.66	0.71	0.79	0.49	0.47		
9+	0.29	0.36	0.42	0.46	0.49	0.51	0.39	0.4	0.44	0.4	0.35	0.4	0.64	0.66	0.71	0.79	0.49	0.47		
mean 5-8,u	0.31	0.35	0.46	0.53	0.48	0.52	0.42	0.45	0.43	0.40	0.37	0.44	0.66	0.66	0.70	0.75	0.52	0.47		

Table 17 (continued). Estimates of beginning year stock size (thousands of fish), instantaneous fishing mortality (F),spawning stock biomass (mt) and percent female maturity of Gulf of Maine-Georges Bank American plaice, estimated from virtual population analysis (VPA), calibrated using the commercial catch at age ADAPT formulation, 1980-1997.

SSB at the start of the spawning season - males and females (mt)																		
	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
Age																		
1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	50	75	30	16	19	10	11	15	29	42	21	33	30	51	37	23	10	8
3	833	739	1169	474	245	226	131	143	230	409	559	316	442	529	646	629	301	144
4	3311	4063	3793	4819	1854	1372	1194	708	745	1157	2203	3376	1639	2295	2541	2787	4888	2325
5	5492	4870	5797	5711	5745	2056	1883	2244	1060	923	1617	3639	4948	2475	2639	2792	2911	6059
6	8546	6917	3914	5055	4829	3428	1546	1929	2036	785	775	1541	3357	2955	1505	1585	1585	2167
7	7230	7157	5904	2414	3792	3034	2079	1171	1674	1421	584	608	1050	2088	1540	930	911	915
8	4211	4569	5614	3232	1379	2541	1864	1563	748	1200	951	461	404	527	1065	868	616	534
9+	19520	7150	10923	7670	5337	3277	2294	1498	1370	1826	1949	1696	1039	1684	2133	685	877	1302
Total	49194	35540	37144	29391	23200	15944	11002	9271	7893	7763	8660	11670	12908	12604	12105	10300	12100	13453
Percent Mature (females)																		
	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
Age																		
1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
3	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24
4	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72
5	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95
6	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99
7+	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100

Table 18. Yield and Spawning Stock Biomass per recruit for American plaice (Catch= Landings + Discards).

The NEFC Yield and Stock Size per Recruit Program - PDBYPRC
 PC Ver.1.2 [Method of Thompson and Bell (1934)] 1-Jan-1992
 Run Date: 24-11-1998; Time: 10:35:19.11

American plaice Gulf of Maine-Georges Bank - 1998

Proportion of F before spawning: .2500
 Proportion of M before spawning: .2500
 Natural Mortality is Constant at: .200
 Initial age is: 1; Last age is: 9
 Last age is a PLUS group; Original age-specific PRs, Mats, and Mean Wts from file: ==> APYPR9.DAT

Age-specific Input data for Yield per Recruit Analysis

Age	Fish Mort Pattern	Nat Mort Pattern	Proportion Mature	Average Weights Catch	Average Weights Stock
1	.0200	1.0000	.0000	.016	.010
2	.0500	1.0000	.0400	.052	.029
3	.0800	1.0000	.2400	.160	.092
4	.4200	1.0000	.7200	.305	.221
5	1.0000	1.0000	.9500	.449	.366
6	1.0000	1.0000	1.0000	.632	.534
7	1.0000	1.0000	1.0000	.866	.742
8	1.0000	1.0000	1.0000	1.107	.980
9+	1.0000	1.0000	1.0000	1.564	1.564

Summary of Yield per Recruit Analysis for: American plaice Gulf of Maine-Georges Bank - 1998

Slope of the Yield/Recruit Curve at F=0.00: --> 2.5298
 F level at slope=1/10 of the above slope (F0.1): -----> .185
 Yield/Recruit corresponding to F0.1: -----> .1792
 F level to produce Maximum Yield/Recruit (Fmax): -----> .346
 Yield/Recruit corresponding to Fmax: -----> .1940
 F level at 20 % of Max Spawning Potential (F20): -----> .397
 SSB/Recruit corresponding to F20: -----> .5065

Listing of Yield per Recruit Results for: American plaice Gulf of Maine-Georges Bank - 1998

	FMORT	TOTCTHN	TOTCTHW	TOTSTKN	TOTSTKW	SPNSTKN	SPNSTKW	% MSP
F0.1	.000	.00000	.00000	5.5167	2.7847	2.8966	2.5330	100.00
	.050	.10278	.09231	5.0049	2.0916	2.3887	1.8518	73.11
	.100	.17196	.14135	4.6610	1.6510	2.0487	1.4214	56.12
	.150	.22193	.16810	4.4131	1.3517	1.8047	1.1308	44.64
	.200	.24967	.17920	4.2757	1.1945	1.6701	.9791	38.65
	.250	.25989	.18256	4.2251	1.1384	1.6207	.9251	36.52
	.300	.28983	.18996	4.0772	.9809	1.4766	.7741	30.56
	.346	.31416	.19320	3.9574	.8611	1.3607	.6601	26.06
	.350	.31416	.19320	3.9574	.8611	1.3607	.6601	26.06
	.397	.33281	.19396	3.8656	.7750	1.2725	.5785	22.84
Fmax	.350	.33439	.19395	3.8579	.7679	1.2651	.5719	22.58
	.397	.35046	.19332	3.7790	.6984	1.1899	.5065	20.00
	.400	.35155	.19323	3.7737	.6939	1.1848	.5023	19.83
	.450	.36634	.19165	3.7013	.6341	1.1163	.4464	17.62
	.500	.37926	.18959	3.6382	.5851	1.0571	.4008	15.82
	.550	.39069	.18727	3.5825	.5443	1.0053	.3632	14.34
	.600	.40089	.18486	3.5329	.5100	.9596	.3317	13.10
	.650	.41009	.18243	3.4883	.4808	.9188	.3051	12.04
	.700	.41845	.18005	3.4478	.4557	.8822	.2823	11.14
	.750	.42609	.17775	3.4108	.4339	.8491	.2626	10.37
F20%	.800	.43313	.17553	3.3768	.4148	.8190	.2456	9.69
	.850	.43964	.17341	3.3454	.3980	.7915	.2306	9.10
	.900	.44570	.17139	3.3163	.3831	.7662	.2173	8.58
	.950	.45136	.16947	3.2890	.3697	.7429	.2056	8.12
	1.000	.45668	.16764	3.2635	.3576	.7213	.1950	7.70

Table 19. Yield per recruit and Spawning Stock Biomass per recruit (including discards) for American plaice.

The NEFC Yield and Stock Size per Recruit Program - PDBYPRCM
PC Ver.1.2 [Method of Thompson and Bell (1934)] 1-Jan-1992

Run Date: 27-11-1998; Time: 12:45:07.22 AMERICAN PLAICE 1998

Proportion of F before spawning: .2500
Proportion of M before spawning: .2500
Natural Mortality is Constant at: .200
Initial age is: 1; Last age is: 9
Last age is a PLUS group;
Original age-specific PRs, Mats, and Mean Wts from file: ==> AP_DIS.DAT

Age-specific Input data for Yield per Recruit Analysis

Age	Fish Mort		Nat Mort		Prop Mat	Proportion of F			Average Weights			
	Pattern	Pattern	Lndgs	LMOT		Catch	Lndgs	LMDsc	ShDsc			
1	.0200	1.0000	.00	.00	.00	.016	.000	.030	.015			
2	.0500	1.0000	.04	.04	.01	.052	.172	.093	.033			
3	.0800	1.0000	.24	.11	.45	.160	.311	.172	.066			
4	.4200	1.0000	.72	.30	.66	.305	.393	.225	.128			
5	1.0000	1.0000	.95	.58	.41	.449	.493	.258	.217			
6	1.0000	1.0000	.99	.85	.14	.632	.652	.285	.277			
7	1.0000	1.0000	1.00	.95	.05	.866	.876	.314	.342			
8	1.0000	1.0000	1.00	.99	.01	1.107	1.210	.300	.296			
9+	1.0000	1.0000	1.00	1.00	.00	1.564	1.581	.378	.239			

Summary of Yield per Recruit Analysis for: AMERICAN PLAICE 1998

Slope of the Yield/Recruit Curve at F=0.00: --> 2.4185
F level at slope=1/10 of the above slope (F0.1): -----> .160
Yield/Recruit corresponding to F0.1: -----> .1542
F level to produce Maximum Yield/Recruit (Fmax): -----> .257
Yield/Recruit corresponding to Fmax: -----> .1638

Listing of Yield per Recruit Results for: AMERICAN PLAICE 1998

FMORT	ALL COMPONENTS		LANDINGS ONLY		LM OT DISCARD		SHRIMP DISCARD	
	NUMBER	WEIGHT	NUMBER	WEIGHT	NUMBER	WEIGHT	NUMBER	WEIGHT
.000	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00000
.050	.10278	.09231	.07971	.08665	.01858	.00457	.00448	.00028
.100	.17196	.14135	.12757	.13008	.03550	.00869	.00888	.00054
.150	.22193	.16810	.15779	.15149	.05094	.01243	.01320	.00079
F0.1	.23051	.17184	.16251	.15418	.05393	.01315	.01408	.00084
.200	.25989	.18256	.17740	.16096	.06504	.01581	.01745	.00103
.250	.28983	.18996	.19025	.16373	.07795	.01888	.02164	.00125
Fmax	.29368	.19064	.19170	.16377	.07974	.01931	.02224	.00128
.300	.31416	.19320	.19861	.16271	.08979	.02168	.02576	.00147
.350	.33439	.19395	.20391	.15957	.10065	.02422	.02983	.00168
.400	.35155	.19323	.20706	.15528	.11065	.02654	.03384	.00188
.447	.36553	.19176	.20862	.15072	.11934	.02854	.03757	.00206
.450	.36634	.19165	.20868	.15044	.11986	.02866	.03780	.00207
.500	.37926	.18959	.20920	.14540	.12834	.03060	.04171	.00225
.550	.39069	.18727	.20892	.14038	.13618	.03237	.04558	.00243
.600	.40089	.18486	.20806	.13549	.14342	.03400	.04941	.00261
.650	.41009	.18243	.20678	.13082	.15012	.03549	.05320	.00278
.700	.41845	.18005	.20519	.12639	.15632	.03685	.05694	.00294
.750	.42609	.17775	.20337	.12221	.16207	.03811	.06066	.00310
.800	.43313	.17553	.20140	.11829	.16740	.03926	.06433	.00326
.850	.43964	.17341	.19932	.11462	.17235	.04032	.06797	.00341
.900	.44570	.17139	.19718	.11118	.17694	.04130	.07158	.00356
.950	.45136	.16947	.19499	.10796	.18121	.04219	.07516	.00371
1.000	.45668	.16764	.19278	.10495	.18518	.04302	.07871	.00385

Table 20. Yield per recruit and Spawning Stock Biomass per recruit for American plaice, simulating a fishery with no discards in the shrimp fishery.

The NEFC Yield and Stock Size per Recruit Program - PDBYPRC
PC Ver.1.2 [Method of Thompson and Bell (1934)] 1-Jan-1992

Run Date:30-11-1998; Time:17:12:05.63 American plaice Gulf of Maine-Georges Bank - NO SHRIMP DISCARDS 1998

Proportion of F before spawning: .2500
Proportion of M before spawning: .2500
Natural Mortality is Constant at: .200
Initial age is: 1; Last age is: 9 Last age is a PLUS group;
Original age-specific PRs, Mats, and Mean Wts from file==> AP_NOSHR.DAT

Age-specific Input data for Yield per Recruit Analysis

Age	Fish Mort Pattern	Nat Mort Pattern	Proportion Mature	Average Weights Catch	Average Weights Stock
1	.0000	1.0000	.0000	.031	.010
2	.0050	1.0000	.0400	.102	.029
3	.0450	1.0000	.2400	.211	.092
4	.4030	1.0000	.7200	.326	.221
5	.9900	1.0000	.9500	.455	.366
6	.9900	1.0000	1.0000	.632	.534
7	1.0000	1.0000	1.0000	.866	.742
8	1.0000	1.0000	1.0000	1.107	.980
9+	1.0000	1.0000	1.0000	1.532	1.564

Summary of Yield per Recruit Analysis: American plaice Gulf of Maine-Georges Bank - NO SHRIMP DISCARDS 1998

Slope of the Yield/Recruit Curve at F=0.00: --> 2.4936
F level at slope=1/10 of the above slope (F0.1): -----> .195
Yield/Recruit corresponding to F0.1: -----> .1841
F level to produce Maximum Yield/Recruit (Fmax): -----> .401
Yield/Recruit corresponding to Fmax: -----> .2015
F level at 20 % of Max Spawning Potential (F20): -----> .418
SSB/Recruit corresponding to F20: -----> .5065

Listing of Yield per Recruit Results: American plaice Gulf of Maine-Georges Bank - NO SHRIMP DISCARDS 1998

	FMORT	TOTCTHN	TOTCTHW	TOTSTKN	TOTSTKW	SPNSTKN	SPNSTKW	% MSP
F0.1	.000	.00000	.00000	5.5167	2.7847	2.8966	2.5330	100.00
	.050	.09896	.09172	5.0239	2.1053	2.4036	1.8644	73.60
	.100	.16526	.14153	4.6944	1.6723	2.0740	1.4406	56.87
	.150	.21287	.16956	4.4582	1.3775	1.8377	1.1536	45.54
	.195	.24523	.18412	4.2981	1.1874	1.6774	.9695	38.28
	.200	.24881	.18548	4.2804	1.1670	1.6597	.9498	37.50
	.250	.27695	.19434	4.1415	1.0112	1.5207	.7998	31.58
	.300	.29964	.19897	4.0298	.8926	1.4089	.6862	27.09
	.350	.31835	.20104	3.9379	.8001	1.3170	.5981	23.61
	.400	.33408	.20154	3.8610	.7267	1.2399	.5285	20.86
Fmax	.401	.33429	.20154	3.8600	.7258	1.2389	.5276	20.83
	.418	.33926	.20147	3.8357	.7035	1.2146	.5065	20.00
	.450	.34751	.20110	3.7954	.6674	1.1743	.4725	18.65
	.500	.35914	.20010	3.7389	.6187	1.1177	.4267	16.85
	.550	.36931	.19878	3.6895	.5783	1.0684	.3888	15.35
	.600	.37831	.19730	3.6460	.5443	1.0249	.3571	14.10
	.650	.38633	.19576	3.6074	.5155	.9862	.3302	13.04
	.700	.39354	.19423	3.5727	.4907	.9516	.3073	12.13
	.750	.40006	.19273	3.5415	.4693	.9204	.2874	11.35
	.800	.40600	.19129	3.5131	.4506	.8921	.2702	10.67
F20%	.850	.41144	.18992	3.4872	.4341	.8662	.2550	10.07
	.900	.41644	.18863	3.4635	.4196	.8426	.2417	9.54
	.950	.42107	.18741	3.4416	.4066	.8208	.2298	9.07
	1.000	.42536	.18627	3.4213	.3949	.8006	.2191	8.65

Table 21. Summary of stochastic projections for Gulf of Maine-Georges Bank American plaice for 1999-2000 fishing mortalities of $F_{0.1}=0.19$, $F_{98}=0.48$, and $F_{mac}=0.35$, and $F=0.0$.

Input for Projections:

Age	Fish Mort Pattern	Nat Mort Pattern	Proportion Mature	Average Weights		
				Catch	Stock	Discards
1	0.0200	1.000	0.0000	0.0160	0.0100	0.0160
2	0.0500	1.000	0.0400	0.0520	0.0290	0.0470
3	0.0800	1.000	0.2400	0.1600	0.0920	0.1260
4	0.4200	1.000	0.7200	0.3050	0.2210	0.2060
5	1.0000	1.000	0.9500	0.4490	0.3660	0.2580
6	1.0000	1.000	1.0000	0.6320	0.5340	0.2930
7	1.0000	1.000	1.0000	0.8660	0.7420	0.3280
8	1.0000	1.000	1.0000	1.1070	0.9800	0.3020
9	1.0000	1.000	1.0000	1.5640	1.5640	0.3430

Projection results:

Year	Recruitment	F	Median	Median	Median
			Landings	Discards	SSB
1998	26390	0.48	3597	889	10802
1999	23856	0.19	1387	263	9109
2000	26390	0.19	1299	252	8582
1998	26390	0.48	3597	889	10802
1999	23856	0.35	2376	459	8788
2000	26390	0.35	1935	408	7318
1998	26390	0.48	3597	889	10802
1999	23856	0.48	3027	592	8553
2000	26390	0.48	2220	501	6514
1998	26390	0.48	3597	889	10802
1999	23856	0.00	0	0	9514
2000	26390	0.00	0	0	10409

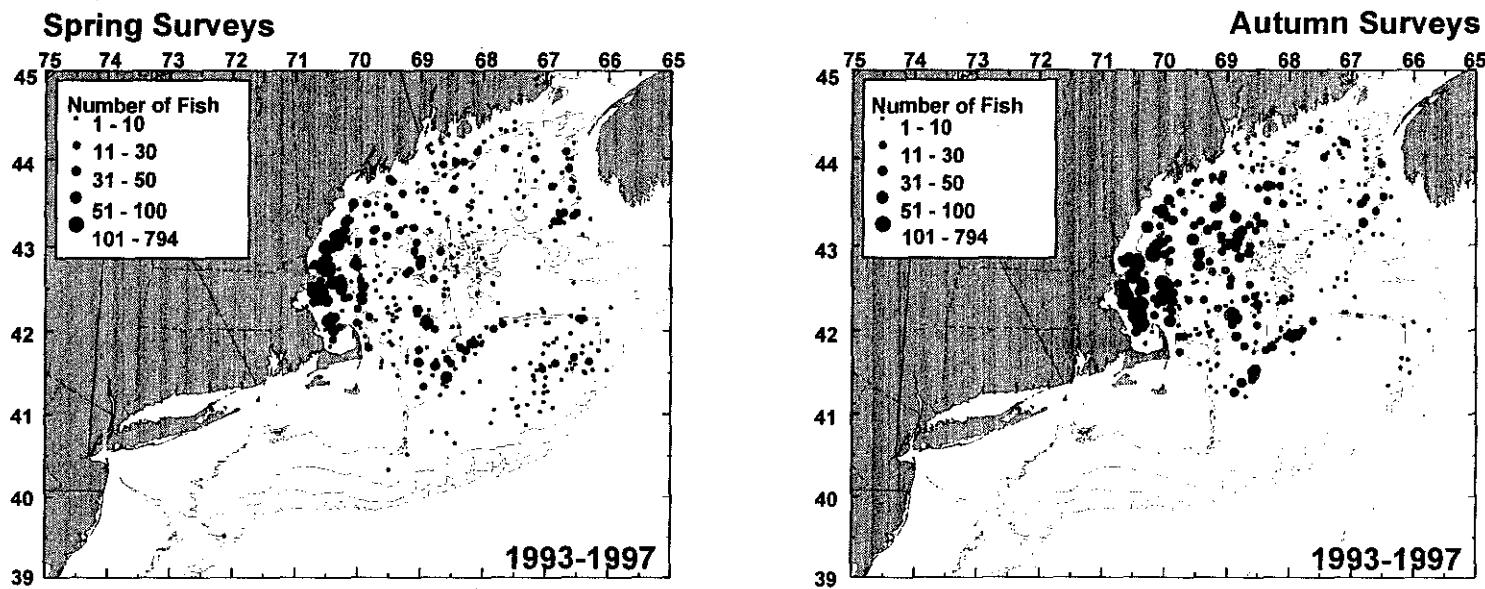


Figure 1. Distribution of American plaice in the NEFSC spring and autumn bottom trawl surveys, 1993-1997.

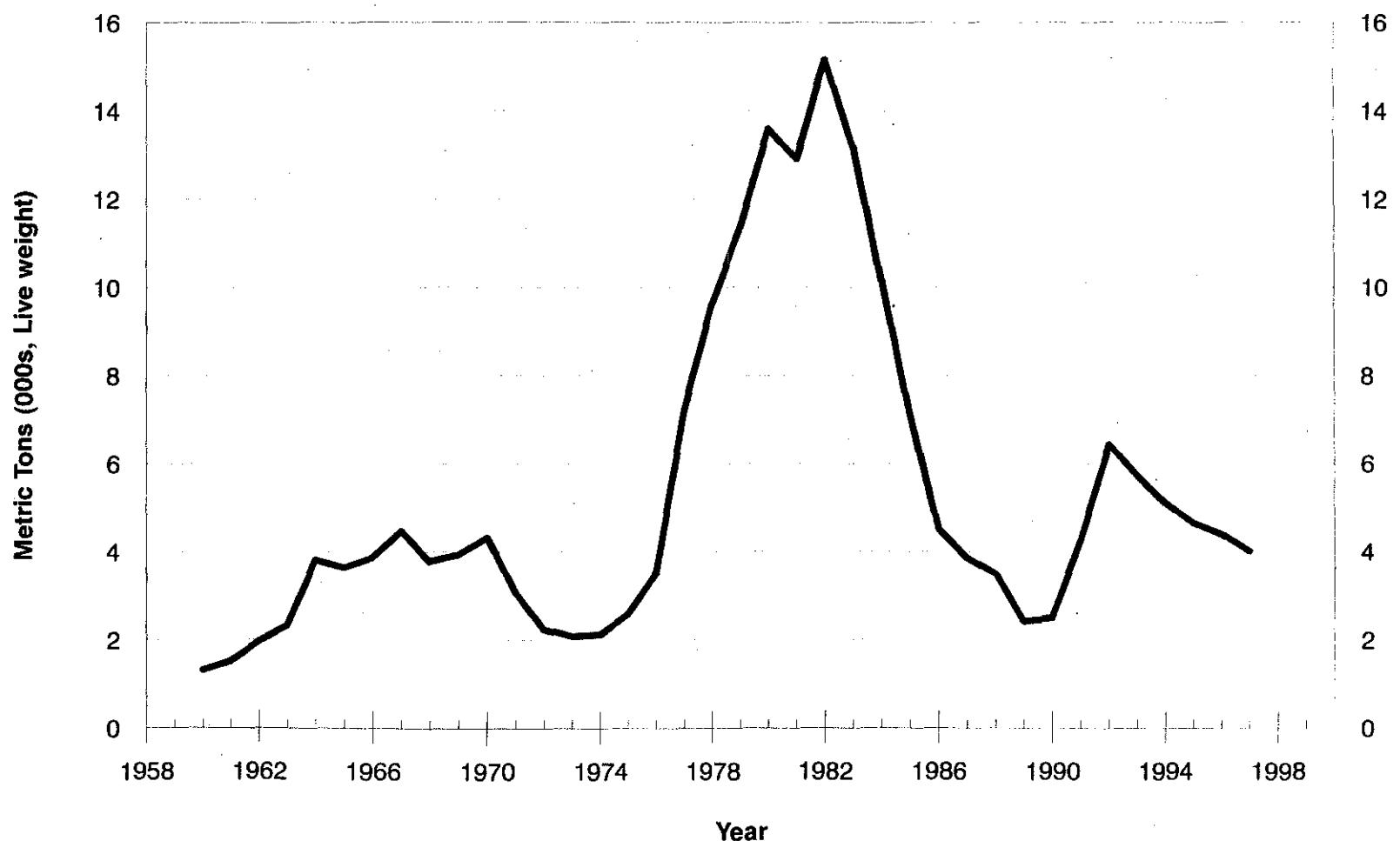


Figure 2. Total commercial landings of Gulf of Maine-Georges Bank American plaice (Division 5Z and 6), 1960-1997.

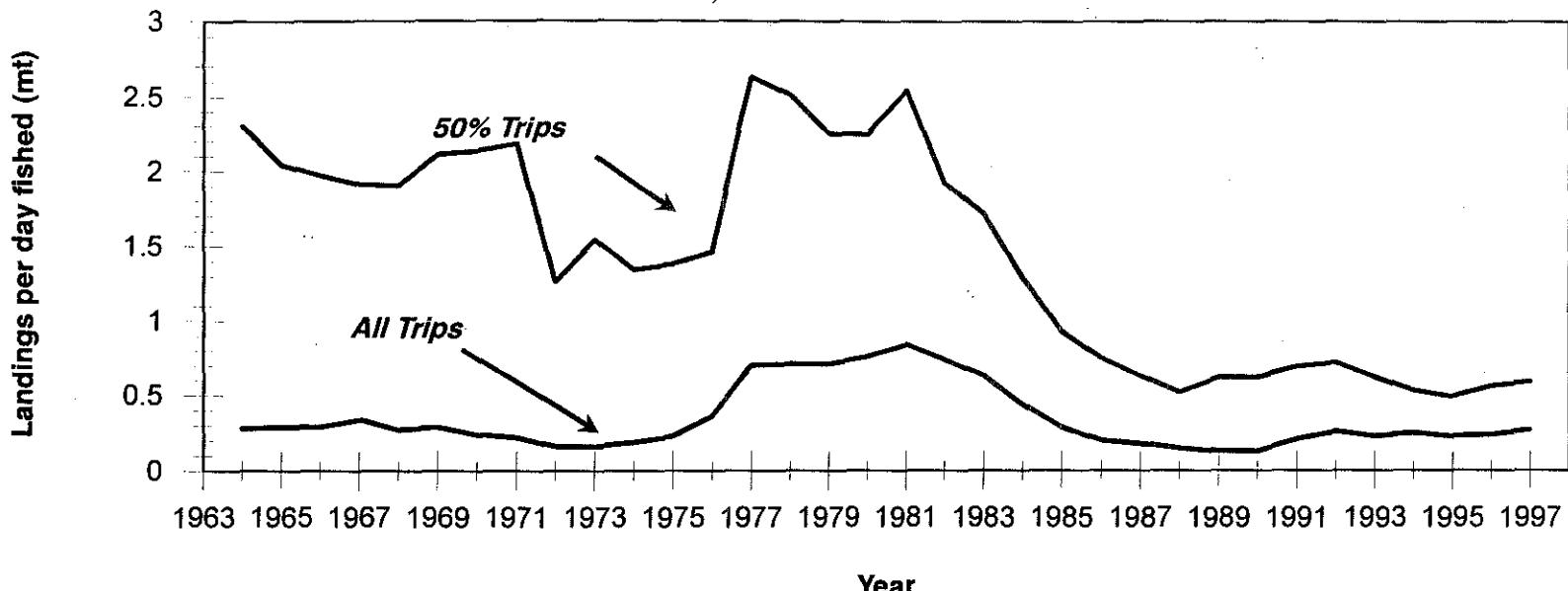


Figure 3. Trends in catch rates (landings (mt) per day) of Gulf of Maine-Georges Bank American plaice for all trips landing plaice and for trips with 50% or more of the landings comprised of plaice , 1964-1997.

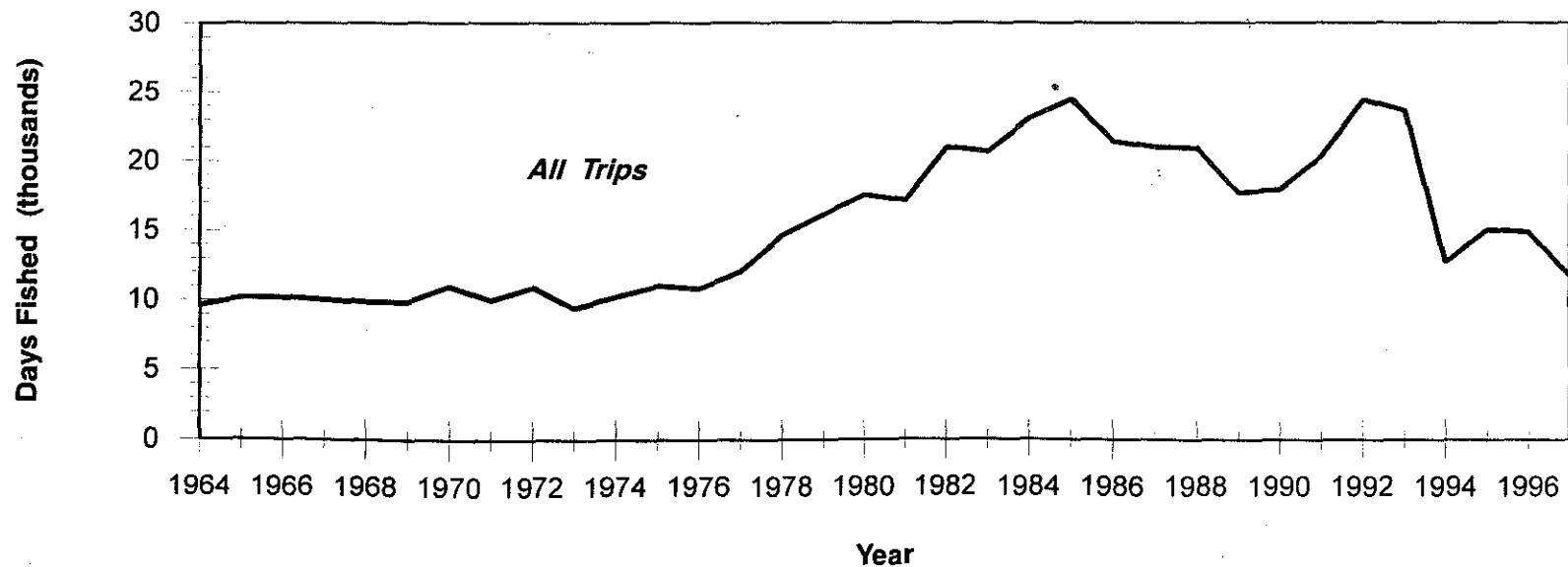


Figure 4. Trends in nominal fishing effort (days fished) for otter trawl trips landing American plaice in the Gulf of Maine-Georges Bank region, 1964-1997.

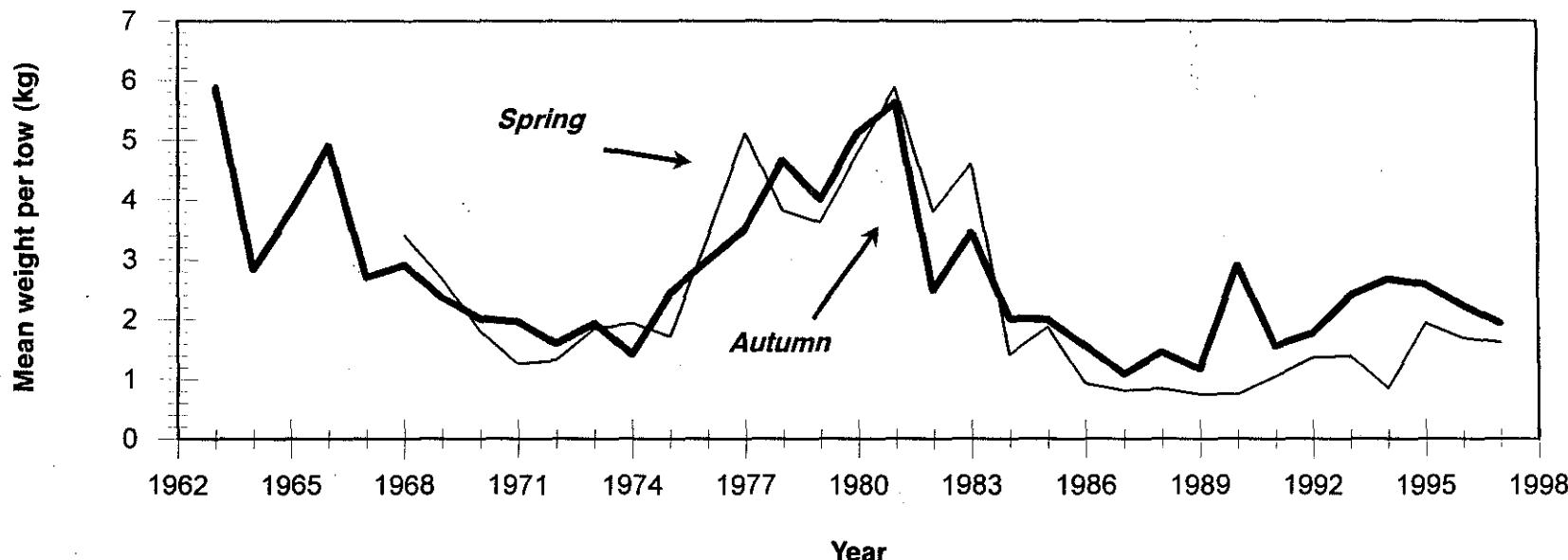


Figure 5. Standardized stratified mean weight per tow (kg) of American plaice in NEFSC spring and autumn research vessel bottom trawl surveys in the Gulf of Maine-Georges Bank region, 1963-1997.

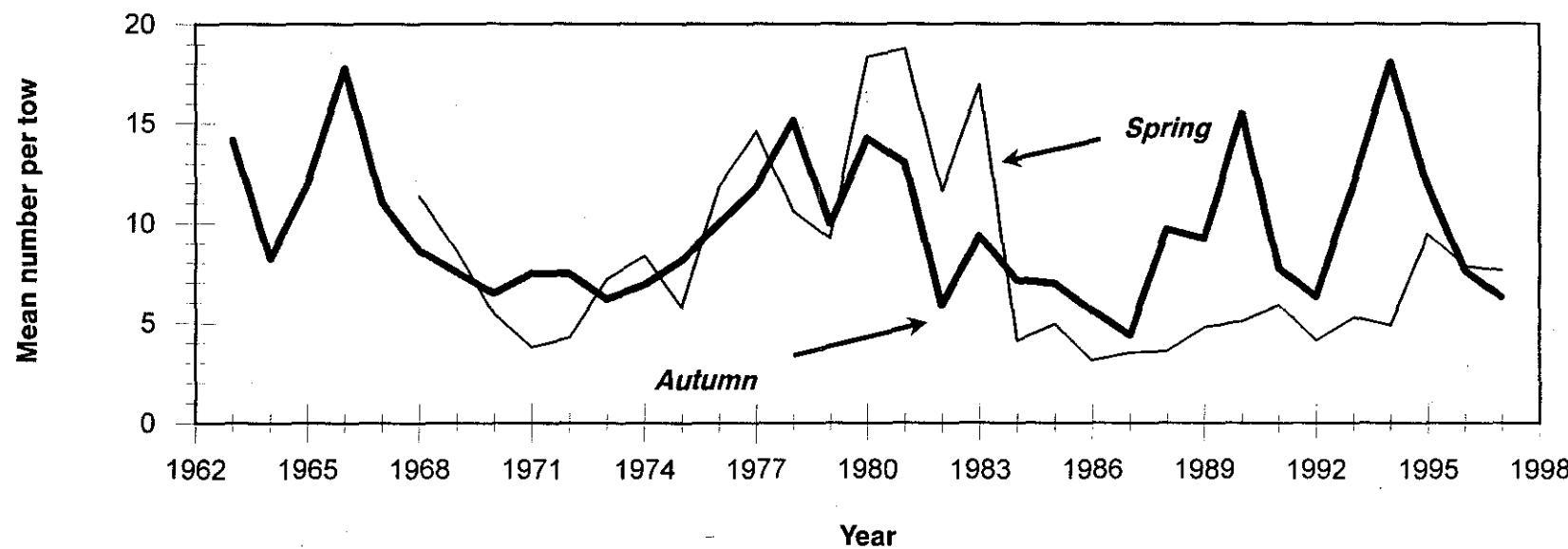


Figure 6. Standardized stratified mean number per tow of American plaice in NEFSC spring and autumn research vessel bottom trawl surveys in the Gulf of Maine-Georges Bank region, 1963 -1997.

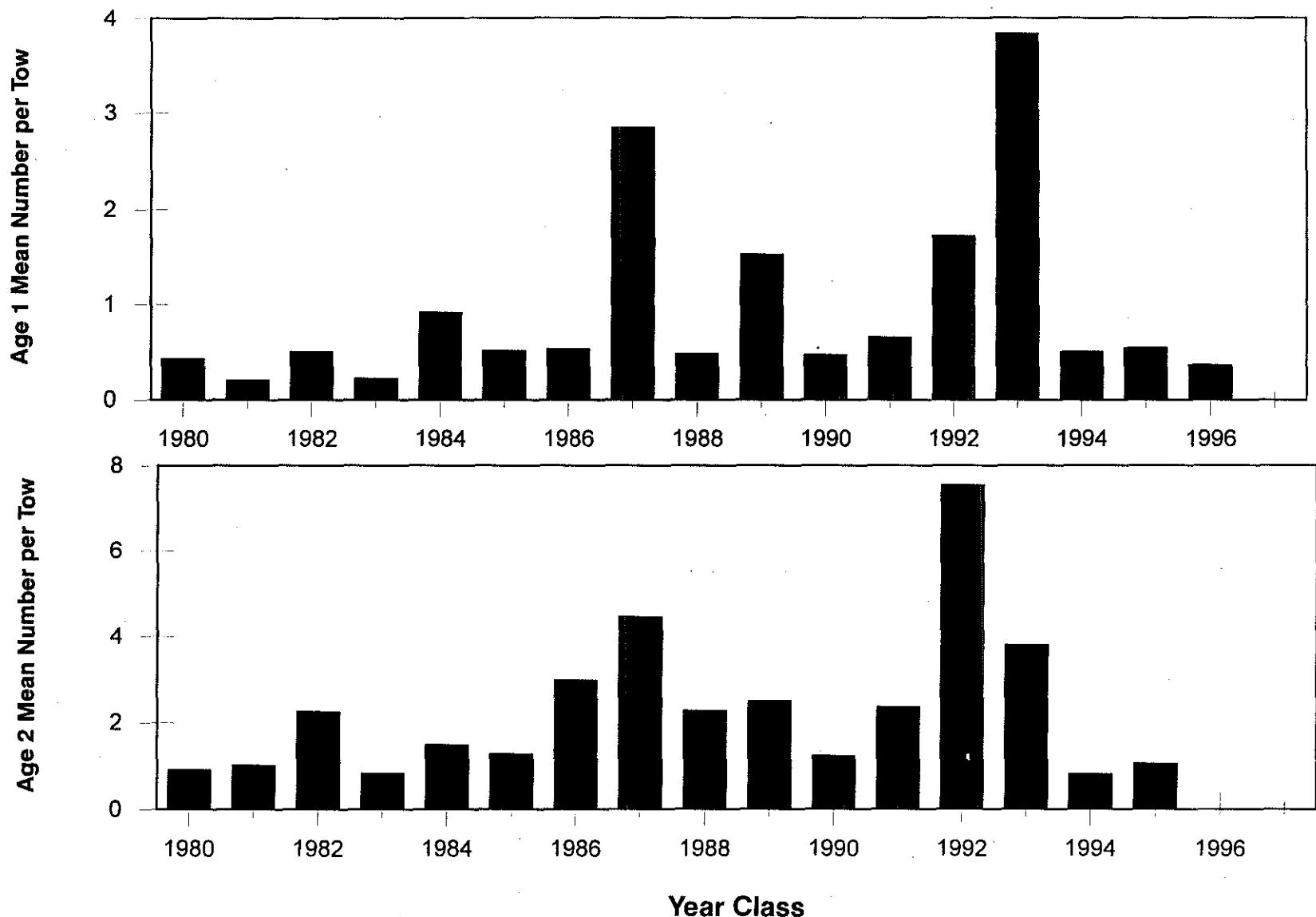


Figure 7. Relative year class strengths of age 1 and age 2 Gulf of Maine-Georges Bank American plaice based on standardized catch (number) per tow indices from NEFSC autumn research vessel bottom trawl surveys, 1980-1997.

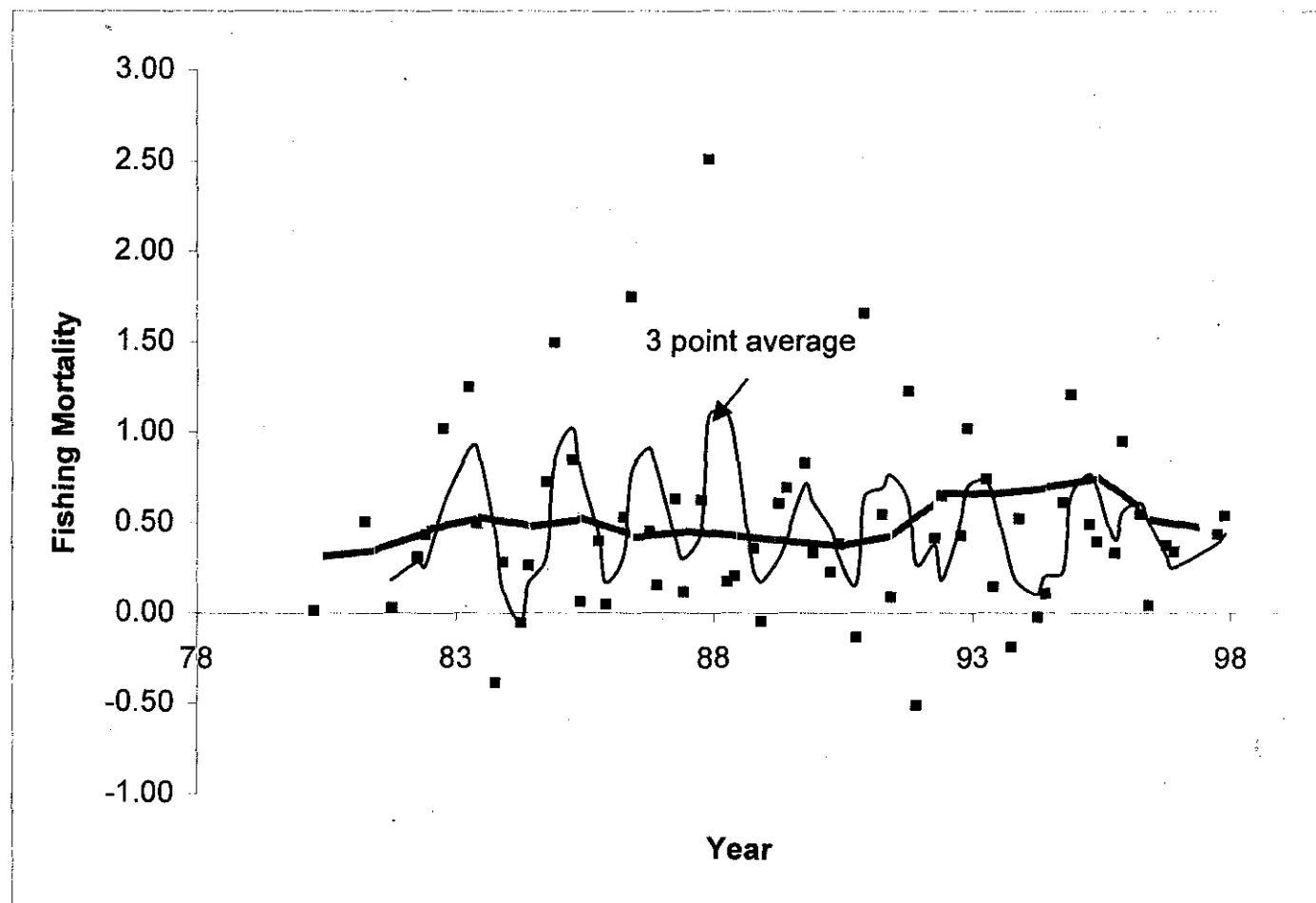


Figure 8. Fishing mortality estimates from NEFSC and MADMF spring and autumn research bottom trawl surveys (solid squares) fitted with a smoothed 3 point running average, 1980-1997. The dashed line is the VPA estimate of mean F (ages 5-8, unweighted).

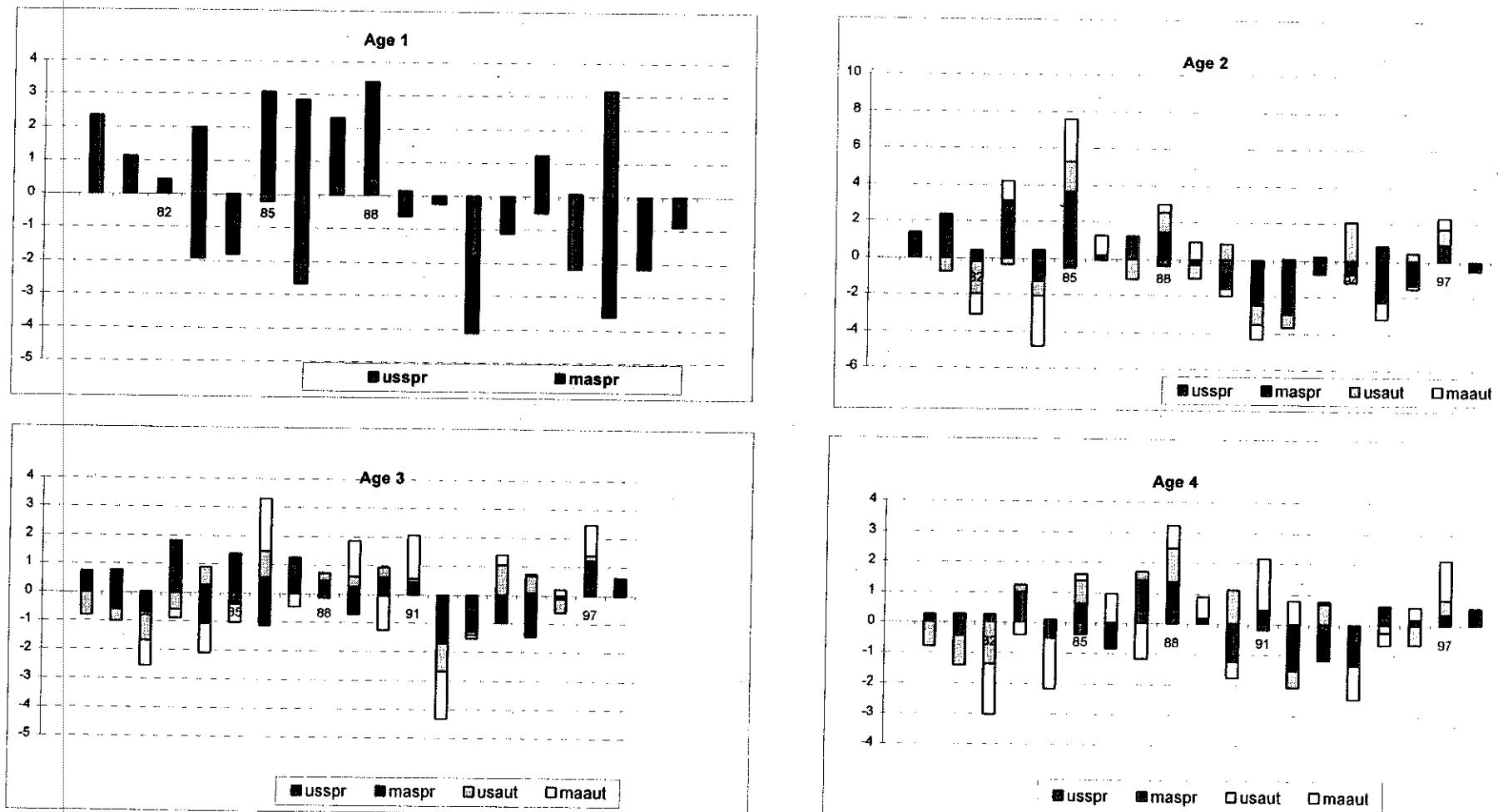


Figure 9. Residual plots (expected - observed) for ages 1-8 for the USA and ages 1-5 for the Massachusetts spring abundance indices, and ages 2-8 for the USA and ages 2-6 for the Massachusetts autumn abundance indices.

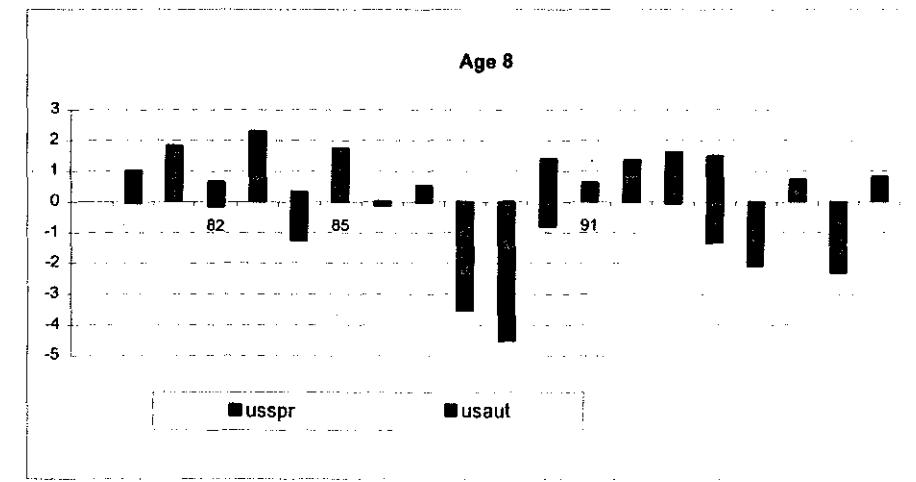
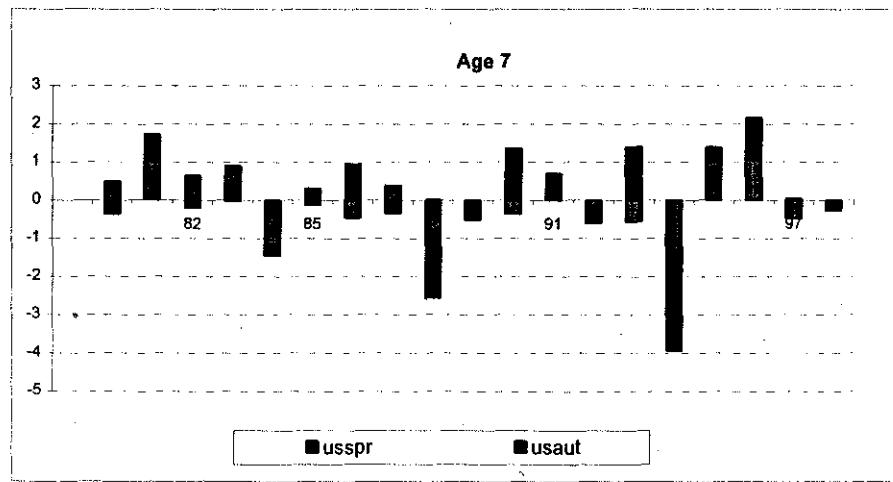
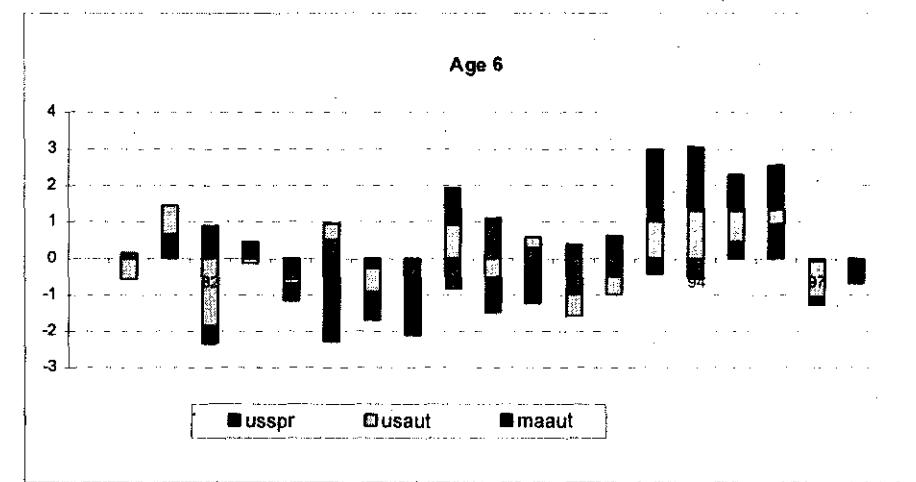
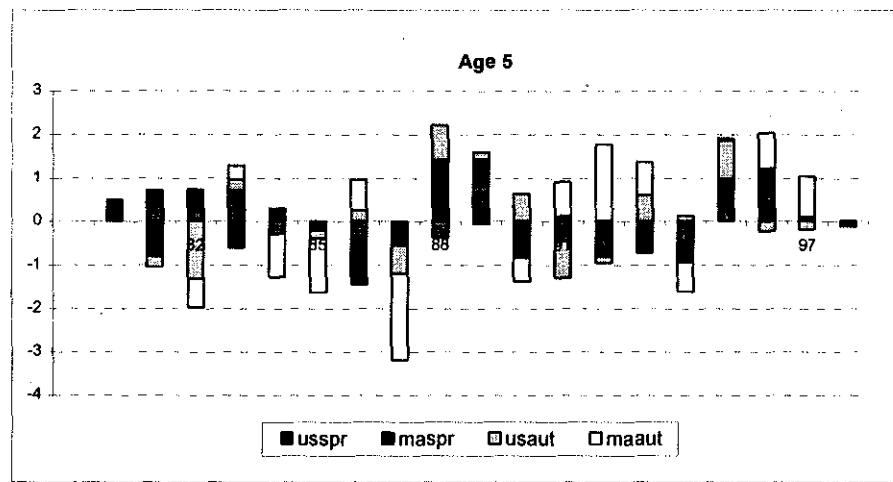


Figure 9. (continued). Residual plots (expected -observed) for ages 1-8 for the USA and ages 1-5 for the Massachusetts spring abundance indices, and ages 2-8 for the USA and ages 2-6 for the Massachusetts autumn abundance indices.

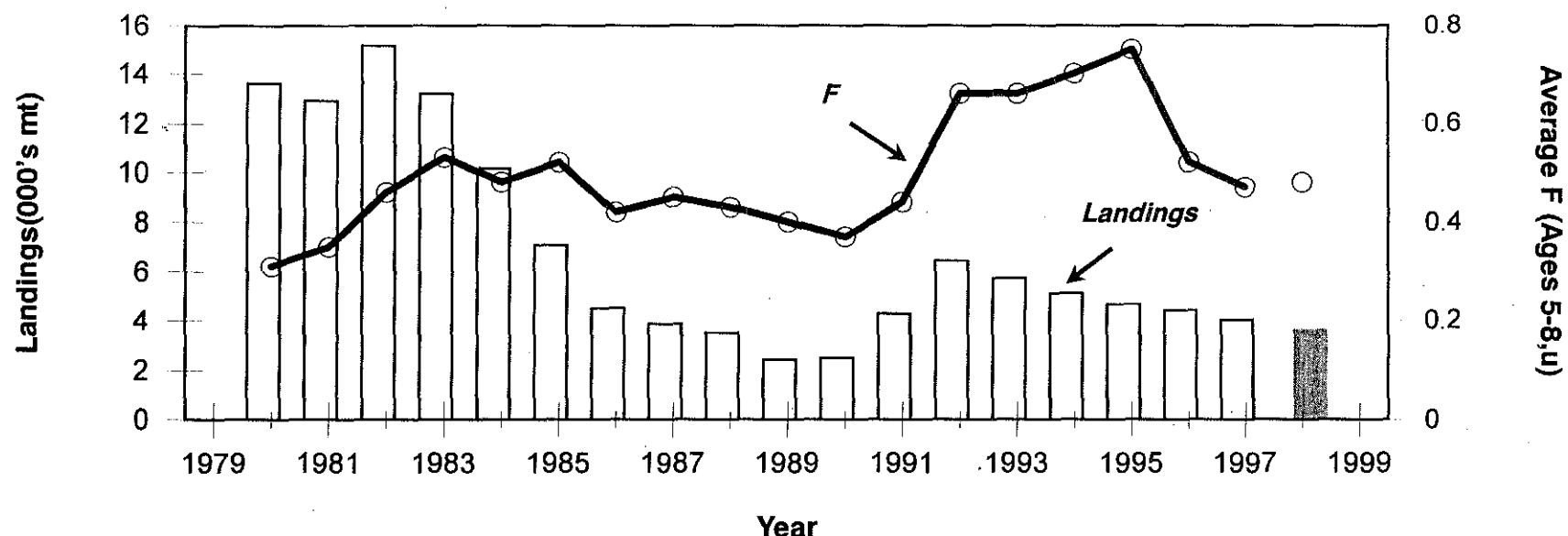


Figure 10. Trends in total commercial landings and fishing mortality for Gulf of Maine-Georges Bank American plaice, 1980 - 1997.

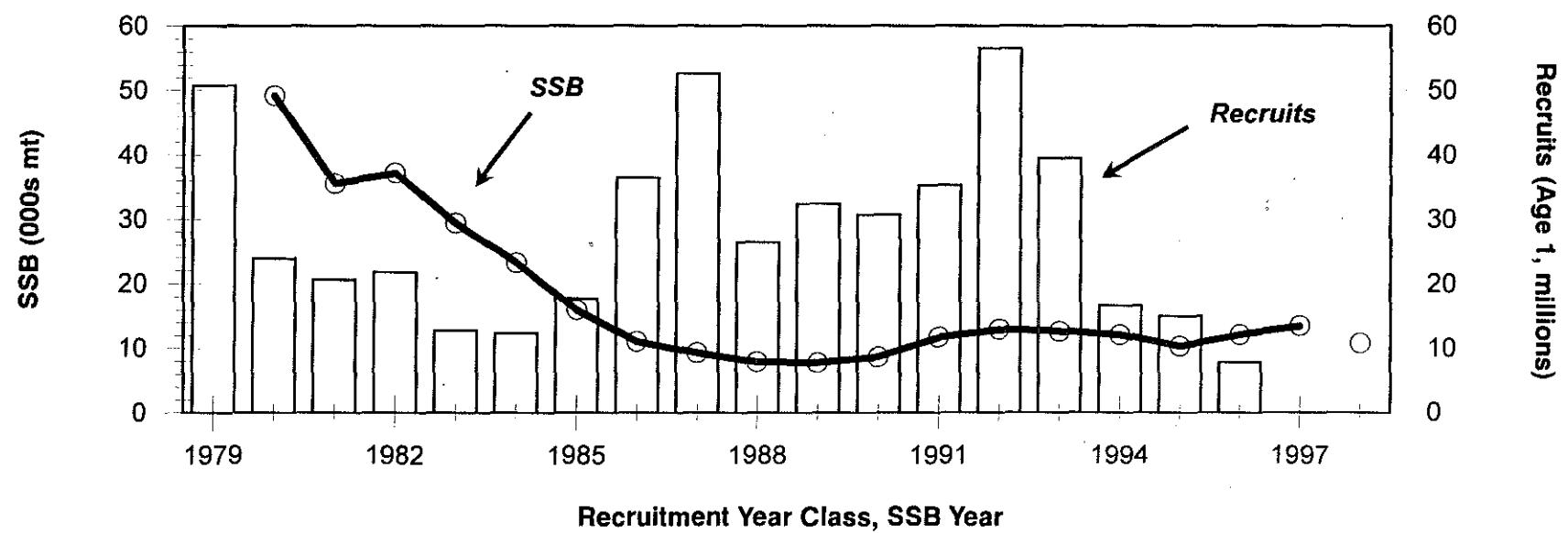


Figure 11. Trends in spawning stock biomass and recruitment for Gulf of Maine-Georges Bank American plaice, 1980-1997.

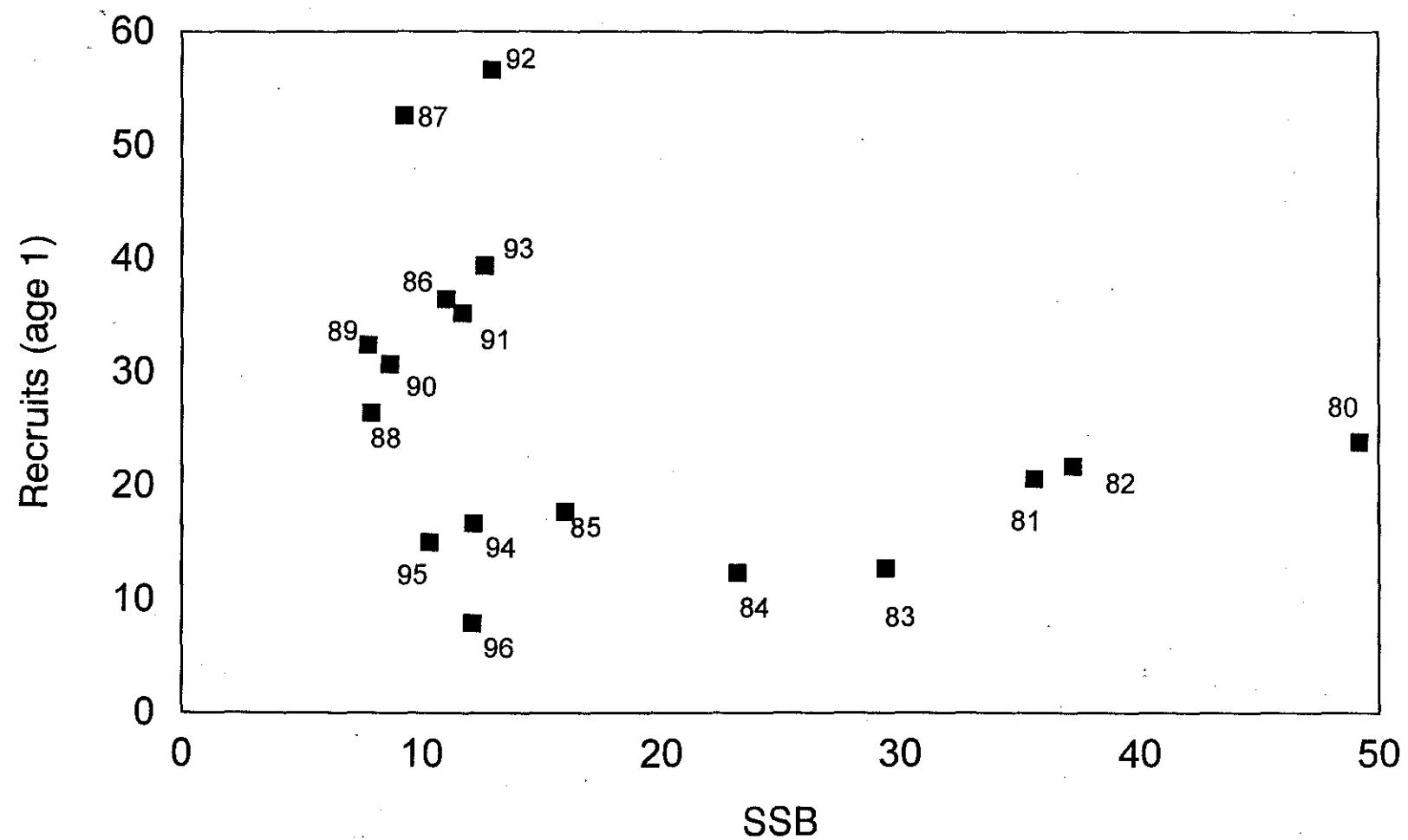


Figure 12. Spawning stock biomass and recruits (age 1) for Gulf of Maine-Georges Bank American plaice.

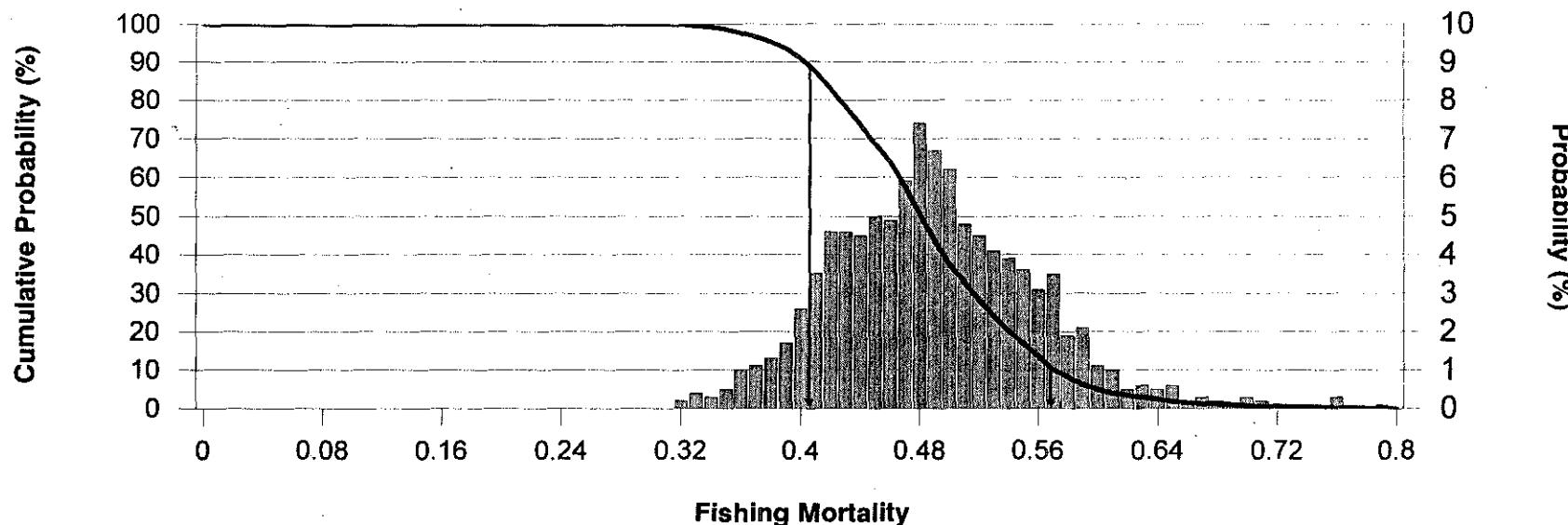


Figure 13. Precision of the estimates of the instantaneous rate of fishing (F) on the fully recruited ages (5+) in 1997 for Gulf of Maine-Georges Bank American plaice. The bar height indicates the probability of values within that range. The solid line gives the cumulative probability that F is greater than any selected value on the X-axis.

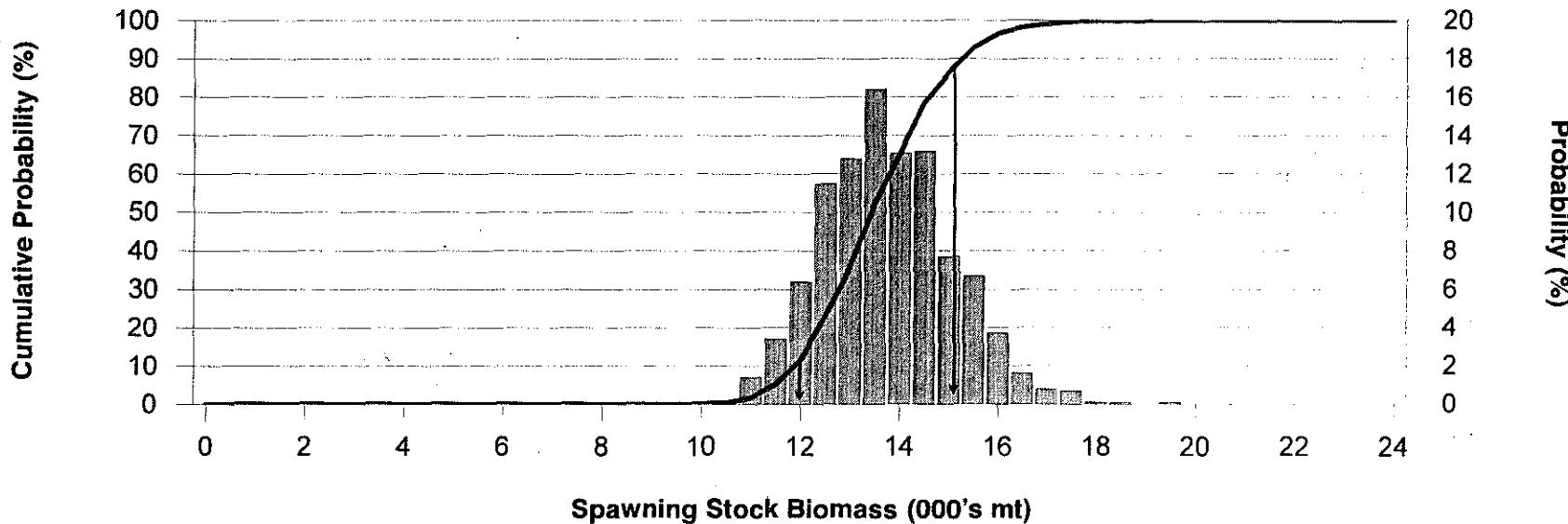


Figure 14. Precision of the estimates of spawning stock biomass (SSB) at the beginning of the spawning season for Gulf of Maine-Georges Bank American plaice, 1997. The bar height indicates the probability of values within that range. The solid line gives the cumulative probability that SSB is less than any selected value on the X-axis.

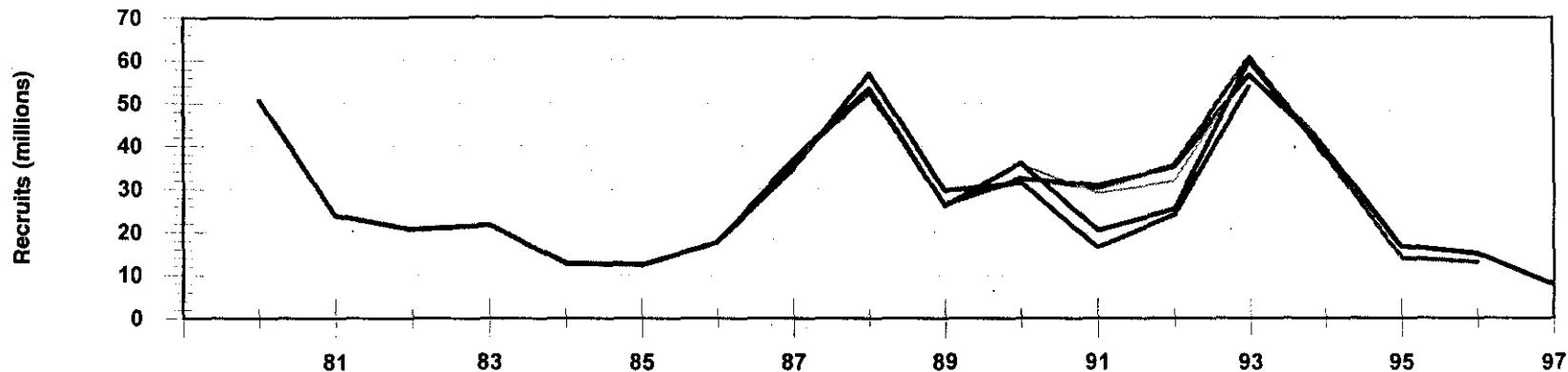


Figure 15. Retrospective analysis of Gulf of Maine-Georges Bank American plaice recruits at age 1 based on the final ADAPT VPA formulation, 1997-1993.

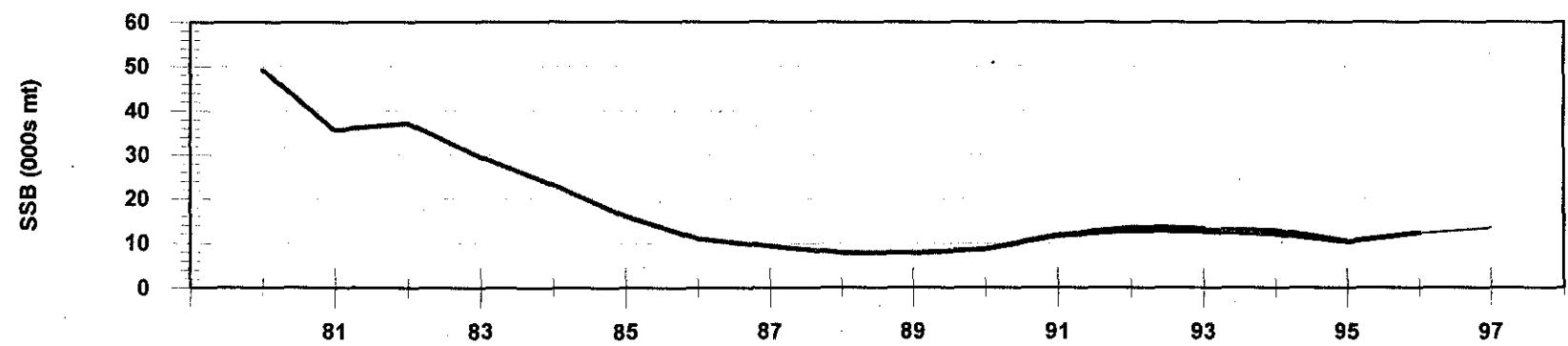


Figure 16. Retrospective analysis of Gulf of Maine-Georges Bank American plaice spawning stock biomass based on the final ADAPT VPA formulation, 1997-1993.

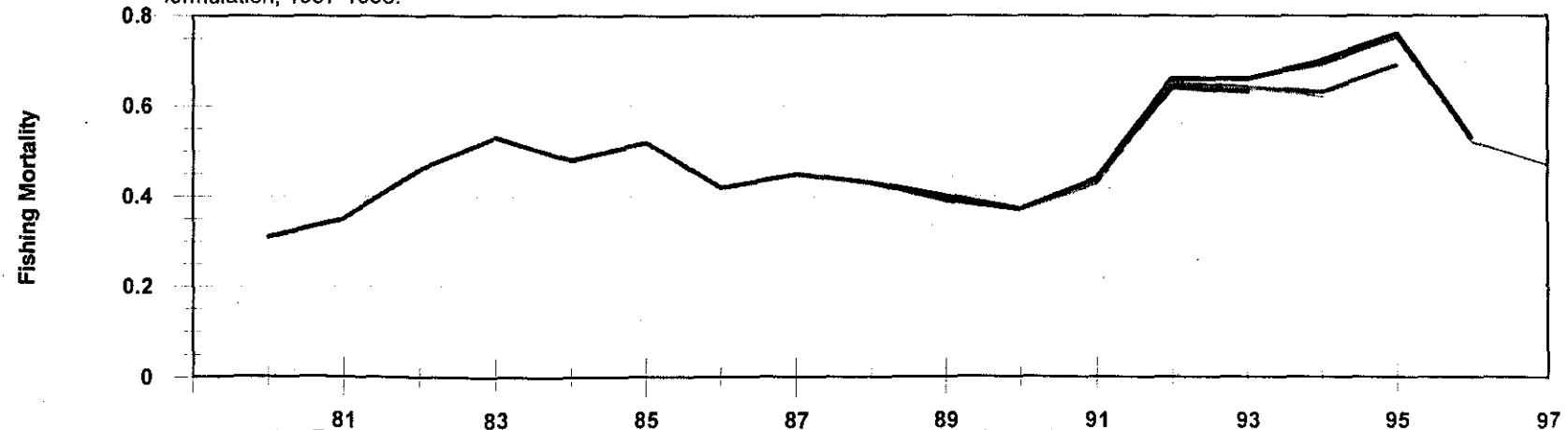


Figure 17. Retrospective analysis of Gulf of Maine-Georges Bank American plaice fishing mortality (average F , ages 5-8, unweighted) based on the final ADAPT VPA formulation, 1997-1993.

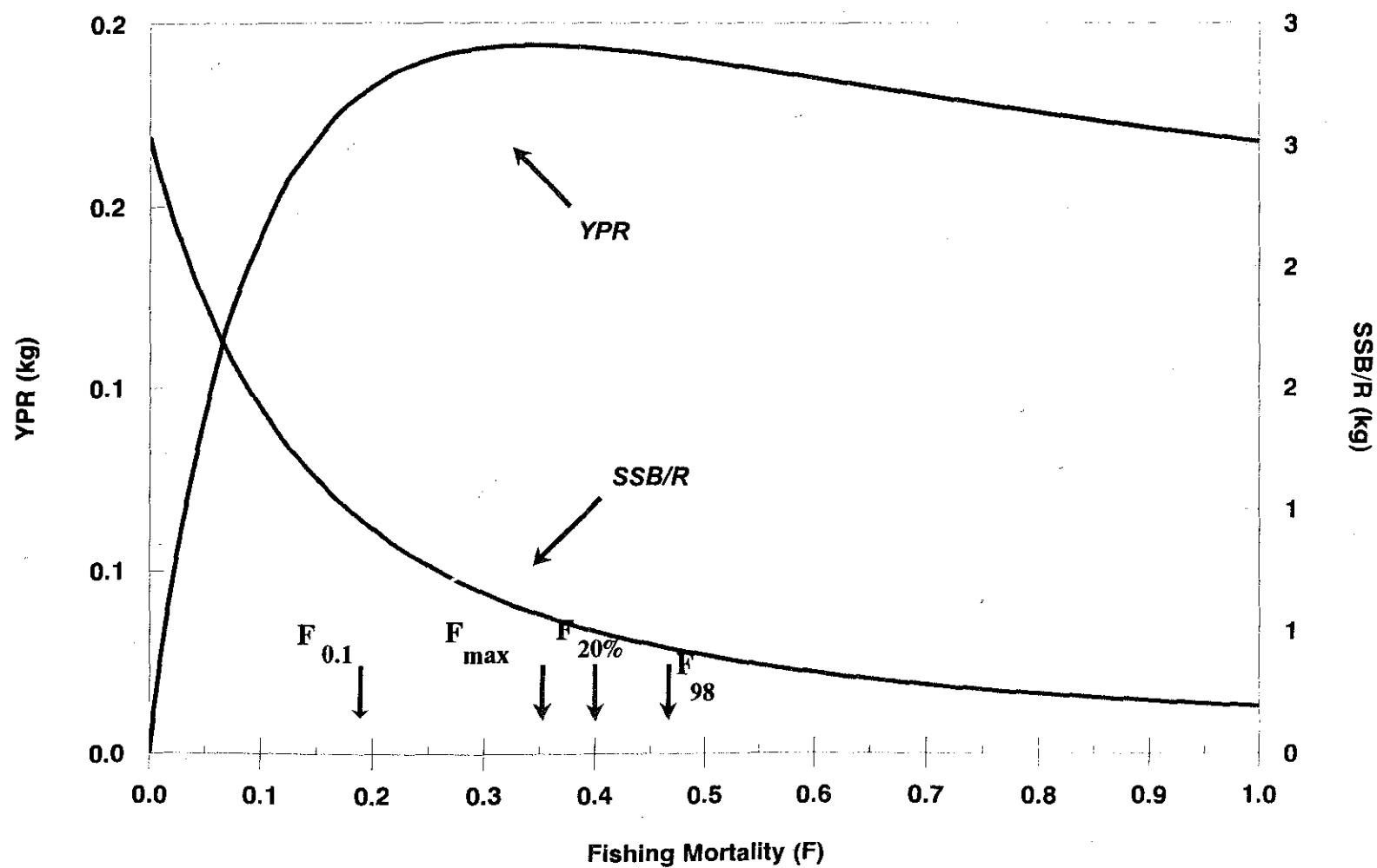


Figure 18 Yield per recruit (YPR) and spawning stock per recruit (SSB/R) for Gulf of Maine-Georges Bank American plaice.

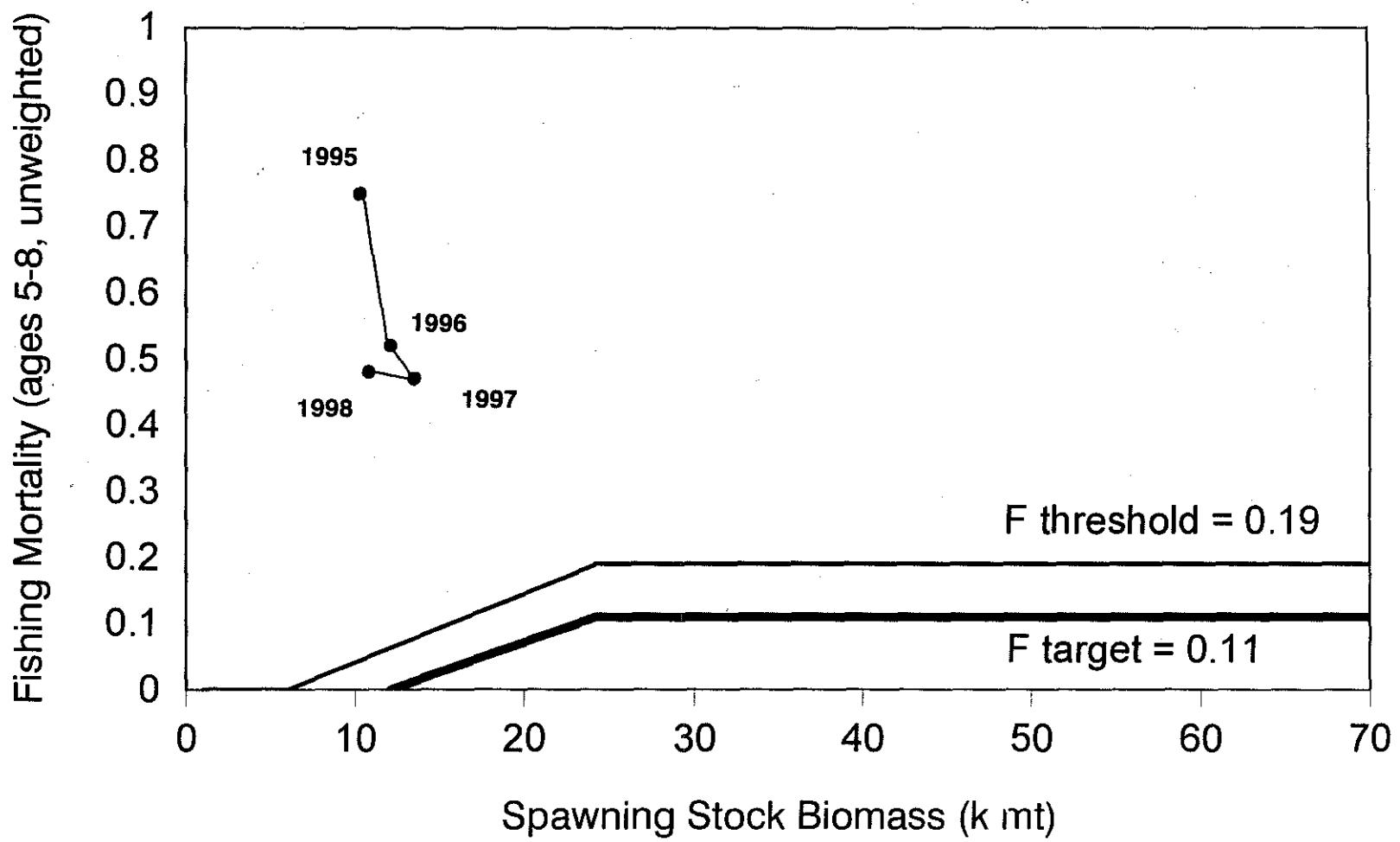


Figure 19. Proposed control rule and recent stock status for Gulf of Maine-Georges Bank American plaice.

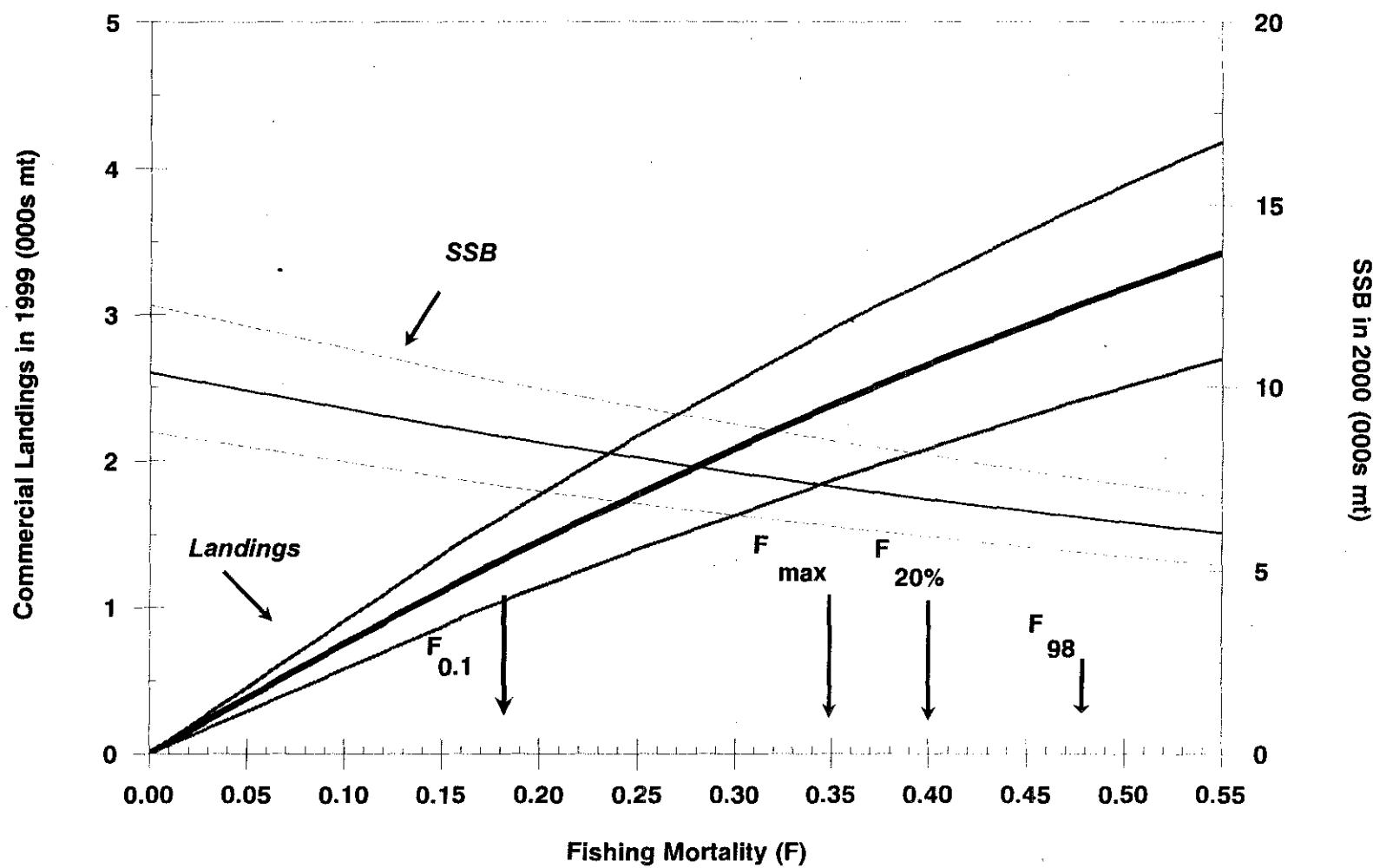


Figure 20. Predicted landings in 1999 and spawning stock biomasses in 2000 with 80% confidence intervals for Gulf of Maine-Georges Bank American plaice as a function of fishing mortality in 2000.

APPENDIX 1

Results of Fisher's Exact test.

Appendix 1. Table 1 Results of Fisher's exact test* for Gulf of Maine and Georges Bank commercial age samples, by quarter, for 1985-1990 combined (# ALK= number of fish in age-length key).

Length	P	Qtr 1		Qtr 2		Qtr 3		Qtr 4	
		GM	GB	GM	GB	GM	GB	GM	GB
24		1				0.50	3	1	2
26	0.13	8	2		2	0.14	8	4	2
28	0.01	22	6	0.00	23	8	0.02	18	20
30	0.00	34	22	0.00	39	26	0.00	43	50
32	0.04	63	19	0.00	74	40	0.00	61	80
34	0.00	82	31	0.00	125	84	0.00	96	123
36	0.00	85	49	0.00	154	131	0.00	124	177
38	0.00	100	54	0.00	174	136	0.00	131	189
40	0.02	96	56	0.00	191	104	0.00	146	163
42	0.05	98	48	0.00	175	99	0.00	169	145
44	0.01	95	51	0.00	172	100	0.00	162	124
46	0.19	103	51	0.00	156	92	0.00	154	111
48	0.59	87	38	0.07	116	74	0.00	125	82
50	0.06	80	33	0.00	99	61	0.00	90	64
52	0.89	59	24	0.28	90	57	0.00	70	58
54	0.97	54	20	0.08	71	53	0.00	53	55
56	0.37	48	17	0.07	58	37	0.00	57	48
58	0.29	42	14	0.28	45	23	0.00	41	40
60	0.12	26	12	0.94	34	25	0.21	29	28
62	1.00	11	6	0.43	11	20	0.06	13	24
64	0.42	10	5	0.62	3	9	0.19	6	16
66	0.81	2	5	1.00	2	3	0.82	4	7
68					6	1.00	1	6	3
70			2		2	1.00	1	3	2
72					3		1		1
74					1		2		
76									1
78									
80							1		

Ho: there are significant differences (Probability (P) ≤ 0.05) in the proportion at age within a length class between Gulf of Maine and Georges Bank age samples.

Appendix 1. Table 2 Results of Fisher's exact test^{*} for quarters 1 and 2 and quarters 3 and 4 commercial age samples for Gulf of Maine and Georges Bank for 1985-1990 combined (# ALK= number of fish in age-length key).

Length	GM				GB				GM				GB			
	P	Qtr1	Qtr2	# ALK	P	Qtr1	Qtr2	# ALK	P	Qtr3	Qtr4	# ALK	P	Qtr3	Qtr4	# ALK
24				1					24	1.00	3	2				1
26	0.67	8	2				2		26	0.67	8	2				4
28	0.90	22	23		0.83	6	8		28	0.64	18	10		0.82	20	3
30	0.87	34	39		0.01	22	26		30	0.56	43	21		0.46	50	9
32	0.18	63	74		0.04	19	40		32	0.14	61	39		0.76	80	17
34	0.00	82	125		0.03	31	84		34	0.58	96	76		0.91	123	41
36	0.00	85	154		0.09	49	131		36	0.00	124	105		0.72	177	61
38	0.00	100	174		0.00	54	136		38	0.00	131	127		0.79	189	62
40	0.02	96	191		0.176	56	104		40	0.00	146	162		0.53	163	60
42	0.59	98	175		0.29	48	99		42	0.02	169	158		0.99	145	61
44	0.43	95	172		0.06	51	100		44	0.00	162	158		0.07	124	47
46	0.73	1063	156		0.13	51	92		46	0.00	154	127		0.93	111	38
48	0.26	87	116		1.00	38	74		48	0.79	125	104		0.71	82	25
50	0.23	80	99		0.98	33	61		50	0.63	90	73		0.10	64	17
52	0.84	59	90		0.75	24	57		52	0.25	70	65		0.06	58	19
54	0.97	54	71		0.56	20	53		54	0.13	53	48		0.14	55	16
56	0.65	48	58		0.72	17	37		56	0.44	57	42		0.52	48	14
58	0.88	42	45		0.05	14	23		58	0.80	41	26		0.33	40	13
60	0.98	26	34		0.08	12	25		60	0.05	29	22		0.82	28	9
62	0.00	11	11		0.55	6	20		62	0.51	13	16		0.60	24	3
64	0.72	10	3		0.39	5	9		64	0.44	6	5		0.09	16	6
66	1.00	2	2		0.79	5	3		66	1.00	4	3		0.89	7	2
68							6		68		1			1.00	6	3
70					1.00	2	3		70		1			1.00	3	2
72							3		72					1.00	1	1
74							1		74						2	
76									76							1
78									78							
80									80							1

Ho: there are significant differences (Probability (P) ≤ 0.05) in the proportion at age within a length class between quarters 1 and 2 and quarters 3 and 4 for Gulf of Maine and Georges Bank commercial age samples.

APPENDIX 2

Listing of Sea Sampling and VTR Discard Information.

Table 1. Sea Sampling and observer length frequency data, 1989-1997.

Table 2. Sea Sampling discard information, 1989-1997.

Table 3. VTR sampling discard information, 1994-1997.

Appendix 2. Table 1. Sea sampling and observer length frequency data for American plaice.

	Otter trawl					Shrimp trawl					Other				
	Qtr1	Qtr2	Qtr3	Qtr4	Total	Qtr1	Qtr2	Qtr3	Qtr4	Total	Qtr1	Qtr2	Qtr3	Qtr4	Total
1989															
No. trips (kept)	1	5	8	0	14	0	0	0	0	0	0	0	2	0	2
No. trips (discards)	3	15	28	10	56	11	12	0	5	28	0	0	3	0	3
No. lengths (kept)	372	464	418	0	1254	0	0	0	0	0	0	0	8	0	8
No. lengths (discards)	409	2510	3840	1917	8676	2189	3354	0	860	6403	0	0	12	0	12
1990															
No. trips (kept)	0	1	1	0	2	0	0	0	0	0	0	3	0	0	3
No. trips (discards)	1	5	7	6	19	19	3	0	0	22	1	11	0	1	13
No. lengths (kept)	0	79	122	0	201	0	0	0	0	0	0	39	0	0	39
No. lengths (discards)	292	380	2488	511	3671	3201	288	0	150	3639	5	530	0	91	626
1991															
No. trips (kept)	2	2	2	3	9	0	0	0	0	0	0	8	9	0	17
No. trips (discards)	5	9	12	10	36	27	11	0	3	41	1	16	8	1	26
No. lengths (kept)	246	193	246	164	849	0	0	0	0	0	0	21	53	0	74
No. lengths (discards)	699	2034	2984	1019	6736	2586	1534	0	256	4376	10	181	41	2	234
1992															
No. trips (kept)	7	3	1	0	11	0	0	0	0	0	0	27	22	22	71
No. trips (discards)	8	4	2	4	18	31	2	0	5	38	1	46	8	15	70
No. lengths (kept)	396	195	78	0	669	0	0	0	0	0	0	308	59	46	413
No. lengths (discards)	956	373	285	229	1843	1797	51	0	253	2101	11	990	13	51	1065
1993															
No. trips (kept)	1	4	1	2	8	2	0	0	0	2	4	50	3	11	68
No. trips (discards)	3	6	3	3	15	54	2	0	3	59	5	57	2	3	67
No. lengths (kept)	176	516	33	686	1411	2	0	0	0	2	54	1064	5	52	1175
No. lengths (discards)	339	617	544	80	1580	2792	272	0	163	3227	20	1624	3	5	1652
1994															
No. trips (kept)	9	2	2	3	16	0	0	0	0	0	12	1	0	0	13
No. trips (discards)	5	1	2	2	10	49	1	0	3	53	3	3	0	0	6
No. lengths (kept)	340	77	29	251	697	0	0	0	0	0	137	89	0	0	226
No. lengths (discards)	77	17	729	95	918	2172	22	0	339	2533	11	8	0	0	19
1995															
No. trips (kept)	10	10	3	4	27	0	0	0	0	0	0	2	9	15	26
No. trips (discards)	14	9	21	16	60	39	6	0	7	52	2	1	7	5	15
No. lengths (kept)	1640	1095	484	127	3346	0	0	0	0	0	0	10	13	28	51
No. lengths (discards)	1414	2027	2496	2156	8093	5246	816	0	556	6618	6	1	68	12	87
1996															
No. trips (kept)	3	5	0	2	10	0	0	0	0	0	17	71	8	2	98
No. trips (discards)	4	6	26	18	54	17	8	0	5	30	3	11	7	2	23
No. lengths (kept)	656	158	0	66	880	0	0	0	0	0	353	1244	22	4	1623
No. lengths (discards)	483	482	2027	4183	7175	1192	953	0	355	2500	34	293	48	8	383
1997															
No. trips (kept)	9	0	3	1	13	0	0	0	0	0	5	39	1	0	45
No. trips (discards)	10	0	3	2	15	14	0	0	0	14	2	6	1	0	9
No. lengths (kept)	714	0	364	68	1146	0	0	0	0	0	132	1478	1	0	1611
No. lengths (discards)	597	0	86	36	719	811	0	0	0	811	9	132	7	0	148

Appendix 2. Table 2. Sea sampling discard information for American plaice.

	Otter trawl					Shrimp trawl					Other				
	Qtr1	Qtr2	Qtr3	Qtr4	Total	Qtr1	Qtr2	Qtr3	Qtr4	Total	Qtr1	Qtr2	Qtr3	Qtr4	Total
1989															
Trips	9	21	35	15	80	17	13	0	8	38	0	0	15	18	33
Total kept (mt)	2.35	1.56	4.96	1.83	10.69	0.19	0.26	0.00	0.11	0.56	0.00	0.00	0.03	0.02	0.05
Total discard (mt)	0.22	0.58	1.94	0.83	3.57	0.86	0.85	0.00	0.68	2.39	0.00	0.00	0.02	0.02	0.04
1990															
Trips	4	9	11	13	37	23	4	0	4	31	17	35	16	18	86
Total kept (mt)	0.27	0.87	2.05	0.21	3.40	0.16	0.06	0.00	0.04	0.26	0.05	0.89	0.02	0.01	0.76
Total discard (mt)	0.09	0.32	0.86	0.72	1.99	1.78	0.22	0.00	0.60	2.61	0.03	0.46	0.02	0.05	0.56
1991															
Trips	14	14	26	47	101	36	11	0	7	54	13	120	246	118	497
Total kept (mt)	1.18	2.80	8.26	10.60	22.84	0.17	0.27	0.00	0.05	0.50	0.05	0.62	0.44	0.14	1.25
Total discard (mt)	0.32	1.27	2.92	4.09	8.60	1.02	0.71	0.00	0.25	1.99	0.04	0.58	0.33	0.18	1.13
1992															
Trips	30	16	12	12	70	70	5	0	6	81	30	231	180	147	588
Total kept (mt)	9.85	13.06	3.33	2.50	28.74	0.26	0.00	0.00	0.07	0.33	0.09	3.12	0.32	0.23	3.76
Total discard (mt)	1.11	0.73	0.82	0.45	3.11	1.33	0.01	0.00	0.11	1.45	0.04	1.18	0.20	0.20	1.62
1993															
Trips	8	11	7	8	34	61	3	0	4	68	22	190	42	77	331
Total kept (mt)	2.73	7.67	1.83	3.14	15.37	0.02	0.00	0.00	0.00	0.02	0.40	7.10	0.06	0.57	8.12
Total discard (mt)	0.46	0.51	0.60	0.15	1.72	0.31	0.03	0.00	0.04	0.38	0.04	1.43	0.05	0.33	1.84
1994															
Trips	13	5	3	5	26	67	2	0	5	74	33	148	82	167	430
Total kept (mt)	4.39	5.41	4.97	5.41	20.18	0.00	0.00	0.00	0.00	0.00	0.76	9.21	0.44	0.57	10.98
Total discard (mt)	0.21	0.15	0.23	0.67	1.26	0.31	0.01	0.00	0.05	0.37	0.05	0.11	0.03	0.03	0.22
1995															
Trips	20	11	22	22	75	54	6	0	9	69	59	228	93	55	435
Total kept (mt)	12.61	11.66	6.12	4.18	34.55	0.00	0.00	0.00	0.00	0.00	1.73	17.42	0.27	0.09	19.51
Total discard (mt)	1.00	2.98	1.55	1.01	6.55	0.38	0.09	0.00	0.29	0.76	0.04	0.41	0.17	0.08	0.70
1996															
Trips	8	15	27	21	71	23	8	0	5	36	50	174	66	32	322
Total kept (mt)	6.53	8.77	0.00	2.61	17.91	0.00	0.00	0.00	0.00	0.00	1.27	9.07	0.16	0.04	10.55
Total discard (mt)	0.83	1.67	0.78	0.98	4.27	0.15	0.24	0.00	0.04	0.43	0.05	0.24	0.04	0.02	0.36
1997															
Trips	19	2	4	2	27	17	0	0	0	17	50	308	37	15	410
Total kept (mt)	9.98	0.00	10.45	0.29	20.72	0.00	0.00	0.00	0.00	0.00	1.10	26.93	0.10	0.02	28.15
Total discard (mt)	1.20	0.02	1.09	0.03	2.34	0.07	0.00	0.00	0.00	0.07	0.09	0.25	0.17	0.00	0.51

Appendix 2. Table 3. VTR sampling discard information for American plaice.

	Otter trawl					Shrimp trawl					Other				
	Qtr1	Qtr2	Qtr3	Qtr4	Total	Qtr1	Qtr2	Qtr3	Qtr4	Total	Qtr1	Qtr2	Qtr3	Qtr4	Total
1994															
Trips	3	1410	2250	1328	4991	0	0	8	103	111	0	1	3	3	7
Total kept (mt)	3.86	511.29	939.79	605.97	2060.90	0.00	0.00	0.08	2.06	2.14	0.00	0.00	0.01	1.08	1.09
Total discard (mt)	0.50	45.76	53.59	41.53	141.38	0.00	0.00	0.02	0.80	0.82	0.00	0.00	0.00	0.01	0.01
1995															
Trips	962	2988	1653	707	6310	375	114	19	106	614	0	3	4	0	7
Total kept (mt)	227.68	818.58	584.21	250.93	1881.40	0.06	7.97	0.43	0.16	8.61	0.00	0.01	0.01	0.00	0.02
Total discard (mt)	12.54	53.05	36.49	17.43	119.50	0.98	0.63	0.02	0.41	2.04	0.00	45.36	0.01	0.00	45.37
1996															
Trips	690	2615	1455	749	5509	382	64	48	122	616	0	9	6	3	18
Total kept (mt)	205.74	697.74	598.37	335.26	1837.10	0.72	0.64	0.23	0.18	1.76	0.00	0.02	0.01	0.00	0.03
Total discard (mt)	8.52	40.58	33.97	18.38	101.47	1.08	0.20	0.26	0.22	1.76	0.00	0.00	0.00	0.00	0.00
1997															
Trips	543	2021	1118	765	4447	330	91	0	37	458	1	5	3	2	11
Total kept (mt)	174.27	508.51	464.18	198.60	1345.55	0.00	2.23	0.00	0.00	2.24	0.00	0.01	0.07	0.00	0.08
Total discard (mt)	13.02	28.21	20.02	10.76	72.00	0.73	0.39	0.00	0.14	1.25	0.00	0.00	0.00	0.00	0.00

APPENDIX 3

Age-specific bottom trawl survey abundance indices for Gulf of Maine-Georges Bank American Plaice

Table 1. Standardized (for vessel changes) stratified mean catch per tow at age (numbers) of American plaice in NEFSC offshore spring and autumn bottom trawl surveys in the Gulf of Maine-Georges Bank region (Strata 26-30,13-25, 36-40), 1963 - 1998.

Table 2. Stratified mean catch per tow at age (numbers) of American plaice in MDMF spring and autumn bottom trawl surveys in Massachusetts Bay and Cape Cod Bay (Regions 4 + 5), 1982-1997.

Appendix 3. Table 1. Stratified mean number per tow by age and stratified mean weight per tow (kg) of American plaice in NEFSC spring and autumn bottom trawl surveys, adjusted for vessel differences, in the Gulf of Maine - Georges Bank¹ area, 1980-1997.

YEAR	AGE GROUP														#/tow	kg/tow	
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14		
Spring																	
1980	0.00	0.57	3.55	4.49	3.00	2.89	1.60	1.12	0.25	0.31	0.23	0.04	0.02	0.02	0.04	18.34	4.78
1981	0.00	0.13	3.49	4.31	3.55	2.67	1.74	1.45	0.79	0.41	0.34	0.07	0.09	0.07	0.09	18.75	5.88
1982	0.00	0.06	1.04	1.79	3.17	2.13	1.34	0.92	0.49	0.35	0.19	0.07	0.01	0.04	0.02	11.601	3.80
1983	0.00	0.20	3.68	3.33	4.48	2.64	1.18	0.58	0.32	0.15	0.15	0.11	0.05	0.02	0.04	16.94	4.60
1984	0.00	0.02	0.35	0.57	0.90	1.30	0.58	0.22	0.10	0.01	0.02	0.01	0.01	0.00	0.03	4.10	1.42
1985	0.00	0.03	0.32	0.98	0.86	0.73	0.86	0.46	0.42	0.12	0.07	0.04	0.02	0.02	0.02	4.94	1.88
1986	0.00	0.01	0.46	0.34	1.01	0.59	0.29	0.21	0.10	0.04	0.04	0.00	0.00	0.00	0.00	3.09	0.92
1987	0.00	0.09	0.61	0.99	0.69	0.51	0.25	0.17	0.07	0.03	0.03	0.03	0.01	0.00	0.00	3.50	0.81
1988	0.00	0.20	0.99	0.84	0.76	0.31	0.23	0.12	0.01	0.09	0.01	0.01	0.00	0.00	0.00	3.58	0.84
1989	0.00	0.05	1.59	1.27	0.86	0.49	0.29	0.16	0.03	0.07	0.01	0.01	0.00	0.00	0.00	4.81	0.75
1990	0.00	0.00	0.57	2.65	1.02	0.54	0.17	0.06	0.04	0.05	0.00	0.00	0.00	0.00	0.00	5.09	0.75
1991	0.00	0.03	0.71	1.63	2.33	0.92	0.15	0.07	0.04	0.02	0.00	0.02	0.00	0.00	0.01	5.91	1.05
1992	0.00	0.06	0.34	1.15	0.88	1.07	0.43	0.11	0.04	0.02	0.01	0.00	0.01	0.00	0.00	4.11	1.36
1993	0.00	0.33	0.84	1.16	1.58	0.61	0.45	0.17	0.08	0.02	0.01	0.02	0.03	0.00	0.00	5.29	1.39
1994	0.00	0.03	1.43	1.14	1.12	0.75	0.23	0.10	0.03	0.01	0.00	0.01	0.01	0.01	0.01	4.88	0.85
1995	0.00	0.31	1.97	3.21	2.31	1.11	0.44	0.22	0.03	0.03	0.03	0.01	0.02	0.01	0.01	9.43	1.94
1996	0.00	0.02	0.47	1.94	3.30	1.31	0.53	0.20	0.05	0.02	0.00	0.00	0.00	0.00	0.00	7.83	1.69
1997	0.00	0.01	0.85	1.66	2.52	2.05	0.39	0.09	0.01	0.00	0.01	0.00	0.02	0.00	0.00	7.62	1.62
1998	0.00	0.06	0.19	1.02	1.12	1.22	0.68	0.16	0.06	0.01	0.01	0.003	0.01	0.00	0.00	4.52	1.11
Autumn																	
1980	0.00	1.58	2.22	2.72	2.85	1.53	1.03	0.93	0.57	0.31	0.20	0.11	0.04	0.07	0.08	14.24	5.12
1981	0.00	0.43	2.79	2.22	2.62	2.30	1.55	0.63	0.58	0.07	0.20	0.20	0.02	0.02	0.12	13.04	5.62
1982	0.00	0.20	0.91	1.65	1.27	0.57	0.48	0.30	0.17	0.19	0.08	0.03	0.00	0.00	0.02	5.88	2.49
1983	0.06	0.50	1.01	2.02	2.92	1.36	0.68	0.34	0.17	0.10	0.03	0.05	0.06	0.01	0.03	9.34	3.45
1984	0.02	0.22	2.24	1.56	1.21	1.07	0.51	0.12	0.10	0.00	0.03	0.01	0.02	0.00	0.01	7.12	2.02
1985	0.02	0.91	0.83	2.64	1.05	0.79	0.41	0.19	0.05	0.03	0.02	0.00	0.00	0.01	0.00	6.95	2.00
1986	0.10	0.51	1.48	0.89	1.45	0.47	0.43	0.16	0.12	0.04	0.01	0.02	0.01	0.00	0.00	5.61	1.56
1987	0.01	0.53	1.27	0.99	0.43	0.69	0.25	0.10	0.04	0.04	0.01	0.02	0.00	0.00	0.00	4.38	1.09
1988	0.00	2.84	2.97	2.39	0.78	0.47	0.10	0.07	0.00	0.03	0.00	0.02	0.00	0.00	0.00	9.69	1.46
1989	0.05	0.48	4.45	2.86	0.98	0.19	0.10	0.02	0.02	0.02	0.02	0.00	0.01	0.02	0.00	9.21	1.17
1990	0.01	1.52	2.26	7.49	2.89	0.59	0.25	0.11	0.07	0.02	0.02	0.01	0.01	0.00	0.01	15.46	2.90
1991	0.02	0.47	2.48	2.03	1.59	0.73	0.30	0.04	0.07	0.00	0.01	0.00	0.00	0.00	0.01	7.71	1.56
1992	0.02	0.65	1.23	1.85	1.28	0.78	0.30	0.07	0.05	0.03	0.02	0.00	0.02	0.00	0.00	6.31	1.78
1993	0.01	1.71	2.35	3.47	2.28	1.05	0.80	0.11	0.04	0.04	0.04	0.00	0.00	0.00	0.00	11.89	2.39
1994	0.04	3.83	7.53	2.81	1.71	1.30	0.04	0.25	0.13	0.01	0.03	0.02	0.00	0.00	0.00	18.07	2.67
1995	0.01	0.50	3.80	3.82	2.50	0.90	0.22	0.04	0.03	0.00	0.00	0.00	0.02	0.00	0.00	11.84	2.58
1996	0.01	0.54	0.81	2.00	2.74	0.93	0.39	0.07	0.04	0.03	0.00	0.00	0.02	0.00	0.02	7.58	2.23
1997	0.01	0.36	1.06	1.55	1.86	1.04	0.32	0.04	0.01	0.01	0.00	0.00	0.00	0.02	0.02	6.27	1.94 ¹

Offshore strata 13-30, 36-40

Appendix 3. Table 2. Stratified mean number per tow by age of American plaice in Massachusetts State spring and autumn bottom trawl surveys in Massachusetts Bay and Cape Cod Bay (Regions 4+5), 1982-1997.

Year	Age											
	0	1	2	3	4	5	6	7	8	9	10	11
Spring												
1982	0.00	7.18	49.25	33.35	17.14	5.00	2.42	1.12	0.26	0.15	0.03	0.07
1983	0.00	1.93	18.76	22.42	21.46	10.22	2.37	0.73	0.20	0.19	0.06	0.10
1984	0.00	2.15	27.44	21.32	10.57	4.64	1.21	0.18	0.09	0.01	0.03	0.07
1985	0.00	21.56	17.16	24.22	9.50	3.77	2.24	0.65	0.76	0.12	0.04	0.03
1986	0.00	27.06	110.27	26.91	14.43	2.84	0.61	0.05	0.08	0.06	0.00	0.16
1987	0.00	34.36	17.26	15.79	3.90	1.76	0.51	0.10	0.02	0.00	0.00	0.00
1988	0.00	81.47	63.57	17.85	8.72	1.54	0.47	0.09	0.00	0.00	0.00	0.00
1989	0.00	8.07	127.26	44.97	11.99	3.03	1.31	0.20	0.03	0.03	0.00	0.05
1990	0.00	7.73	25.37	56.71	16.48	3.43	0.53	0.11	0.10	0.13	0.00	0.00
1991	0.00	2.10	19.98	34.77	18.98	3.24	0.18	0.07	0.01	0.00	0.00	0.00
1992	0.00	8.20	11.06	33.98	14.99	7.42	1.11	0.45	0.00	0.00	0.00	0.00
1993	0.00	11.60	18.98	16.08	9.16	3.45	0.81	0.04	0.02	0.00	0.00	0.00
1994	0.00	11.60	52.57	22.12	7.13	3.88	1.03	0.31	0.00	0.00	0.00	0.00
1995	0.00	0.54	34.65	49.64	10.32	3.16	0.62	0.17	0.03	0.05	0.02	0.00
1996	0.00	2.29	4.14	14.92	31.39	6.33	1.01	0.77	0.01	0.00	0.00	0.00
1997	0.00	1.55	7.96	13.95	17.24	12.21	2.41	0.21	0.00	0.00	0.00	0.00
Autumn												
1982	0.17	13.24	15.46	10.22	5.11	1.14	0.56	0.14	0.05	0.05	0.01	0.08
1983	1.29	52.17	18.98	10.02	8.30	1.39	0.32	0.15	0.05	0.06	0.00	0.01
1984	0.11	3.14	13.24	4.27	1.83	0.77	0.24	0.04	0.05	0.00	0.00	0.00
1985	0.00	60.97	9.45	14.21	1.56	0.14	0.03	0.02	0.00	0.00	0.00	0.00
1986	0.23	41.27	40.08	12.07	5.30	0.39	0.13	0.01	0.00	0.00	0.00	0.00
1987	0.24	46.36	14.60	3.00	0.52	0.23	0.07	0.01	0.04	0.00	0.00	0.00
1988	0.00	85.63	41.28	13.98	1.34	0.45	0.08	0.00	0.00	0.00	0.00	0.00
1989	0.03	57.56	122.25	31.03	2.33	0.13	0.01	0.01	0.00	0.00	0.00	0.00
1990	0.08	31.99	14.20	20.12	3.93	0.21	0.03	0.00	0.00	0.00	0.00	0.00
1991	0.04	24.07	90.36	40.05	11.51	1.17	0.14	0.00	0.00	0.00	0.00	0.00
1992	0.00	46.33	12.99	29.79	11.04	1.38	0.00	0.00	0.12	0.00	0.00	0.00
1993	0.00	76.21	36.80	17.59	6.85	1.71	0.69	0.00	0.00	0.00	0.00	0.00
1994	0.00	36.71	79.31	10.76	2.91	1.56	0.23	0.14	0.00	0.00	0.00	0.00
1995	0.00	11.84	44.22	24.93	4.21	0.91	0.08	0.00	0.00	0.00	0.00	0.00
1996	0.09	16.25	19.25	27.55	13.96	1.39	0.28	0.00	0.08	0.00	0.00	0.00
1997	0.00	13.61	28.08	17.91	10.29	1.46	0.19	0.01	0.00	0.00	0.00	0.00

APPENDIX 4

Full listing of ADAPT VPA Calibration Output and Diagnostics for Gulf of Maine-Georges Bank American Plaice.

Woods Hole Assessment Toolbox American Plaice Gulf of Maine-Georges Bank 1998 Base Run Run Number 41 11/22/98

6:08:13 PM

Version 1.0.5

American Plaice Gulf of Maine-Georges Bank 1998 Base Run 1980 - 1998

Input Parameters and Options Selected

Natural mortality is 0.2

Oldest age (not in the plus group) is 8

For all years prior to the terminal year (1997), backcalculated

stock sizes for the following ages used to estimate

total mortality (2) for age 8 : 5 6 7 8

This method for estimating F on the oldest age is generally used when a flat-topped partial recruitment curve is thought to be characteristic of the stock.

F for age 9+ is then calculated from the following

ratios of F[age 9+] to F[age 8]

1980	1
1981	1
1982	1
1983	1
1984	1
1985	1
1986	1
1987	1
1988	1
1989	1
1990	1
1991	1
1992	1
1993	1
1994	1
1995	1
1996	1
1997	1

Stock size of the 9+ group is then calculated using

the following method: CATCH EQUATION

Partial recruitment estimate for 1998

1	0.02
2	0.05
3	0.08
4	0.44
5	1
6	1
7	1
8	1

Objective function is Sum w*(LOG(OBS)-LOG(PRED))**2

Indices normalized (by dividing by mean observed value)

before tuning to VPA stocksizes

Downweighting is not used

Biomass estimates (other than SSB) reflect mean stock sizes.

SSB calculated as in the NEFSC projection program

(see note below SSB table for description of the algorithm).

Initial estimates of parameters for the Marquardt algorithm
and lower and upper bounds on the parameter estimates:

Par.	Initial Est	Lower Bnd	Upper Bnd
N 2	1.00E+03	0.00E+00	1.00E+06
N 3	1.00E+03	0.00E+00	1.00E+06
N 4	2.00E+03	0.00E+00	1.00E+06
N 5	9.00E+03	0.00E+00	1.00E+06
N 6	5.00E+03	0.00E+00	1.00E+06
N 7	5.00E+03	0.00E+00	1.00E+06
N 8	5.00E+03	0.00E+00	1.00E+06
q spr_us1	1.00E-02	0.00E+00	1.00E+00
q spr_us2	1.00E-02	0.00E+00	1.00E+00
q spr_us3	1.00E-02	0.00E+00	1.00E+00
q spr_us4	1.00E-02	0.00E+00	1.00E+00
q spr_us5	1.00E-02	0.00E+00	1.00E+00
q spr_us6	1.00E-02	0.00E+00	1.00E+00
q spr_us7	1.00E-02	0.00E+00	1.00E+00
q spr_us8	1.00E-02	0.00E+00	1.00E+00
q us1aut2	1.00E-02	0.00E+00	1.00E+00

q us2aut3	1.00E-02	0.00E+00	1.00E+00
q us3aut4	1.00E-02	0.00E+00	1.00E+00
q us4aut5	1.00E-02	0.00E+00	1.00E+00
q us5aut6	1.00E-02	0.00E+00	1.00E+00
q us6aut7	1.00E-02	0.00E+00	1.00E+00
q us7aut8	1.00E-02	0.00E+00	1.00E+00
q spr_ma1	1.00E-02	0.00E+00	1.00E+00
q spr_ma2	1.00E-02	0.00E+00	1.00E+00
q spr_ma3	1.00E-02	0.00E+00	1.00E+00
q spr_ma4	1.00E-02	0.00E+00	1.00E+00
q spr_ma5	1.00E-02	0.00E+00	1.00E+00
q ma1aut2	1.00E-02	0.00E+00	1.00E+00
q ma2aut3	1.00E-02	0.00E+00	1.00E+00
q ma3aut4	1.00E-02	0.00E+00	1.00E+00
q ma4aut5	1.00E-02	0.00E+00	1.00E+00
q ma5aut6	1.00E-02	0.00E+00	1.00E+00

The following indices of abundance are available

1	spr_us1
2	spr_us2
3	spr_us3
4	spr_us4
5	spr_us5
6	spr_us6
7	spr_us7
8	spr_us8
9	spr_us9
10	us0aut1
11	us1aut2
12	us2aut3
13	us3aut4
14	us4aut5
15	us5aut6
16	us6aut7
17	us7aut8
18	us8aut9
19	lpue_all6,9
20	spr_ma1
21	spr_ma2
22	spr_ma3
23	spr_ma4
24	spr_ma5
25	ma0aut1
26	ma1aut2
27	ma2aut3
28	ma3aut4
29	ma4aut5
30	ma5aut6

The Indices that will be used in this run are:

1	spr_us1
2	spr_us2
3	spr_us3
4	spr_us4
5	spr_us5
6	spr_us6
7	spr_us7
8	spr_us8
9	us1aut2
10	us2aut3
11	us3aut4
12	us4aut5
13	us5aut6
14	us6aut7
15	us7aut8
16	spr_ma1
17	spr_ma2
18	spr_ma3
19	spr_ma4
20	spr_ma5
21	ma1aut2
22	ma2aut3

23 ma3aut4
 24 ma4aut5
 25 ma5aut6

Obs Indices (before transformation) by index and year; with Index means

	1980	1981	1982	1983	1984	1985	1986
spr_us1	0.57	0.13	0.06	0.20	0.02	0.03	0.01
spr_us2	3.55	3.49	1.04	3.68	0.35	0.32	0.46
spr_us3	4.49	4.31	1.79	3.33	0.57	0.98	0.34
spr_us4	3.00	3.55	3.17	4.48	0.90	0.86	1.01
spr_us5	2.89	2.67	2.13	2.64	1.30	0.73	0.59
spr_us6	1.60	1.74	1.34	1.18	0.58	0.86	0.29
spr_us7	1.12	1.45	0.92	0.58	0.22	0.46	0.21
spr_us8	0.25	0.79	0.49	0.32	0.10	0.42	0.10
us1aut2	0.00	1.58	0.43	0.20	0.50	0.22	0.92
us2aut3	0.00	2.22	2.79	0.91	1.01	2.24	0.84
us3aut4	0.00	2.72	2.22	1.65	2.02	1.56	2.68
us4aut5	0.00	2.85	2.62	1.27	2.92	1.21	1.07
us5aut6	0.00	1.53	2.30	0.57	1.36	1.07	0.81
us6aut7	0.00	1.03	1.55	0.48	0.68	0.51	0.41
us7aut8	0.00	0.93	0.63	0.30	0.34	0.12	0.19
spr_ma1	0.00	0.00	7.18	1.93	2.15	21.56	27.06
spr_ma2	0.00	0.00	49.25	18.76	27.44	17.16	110.27
spr_ma3	0.00	0.00	33.35	22.42	21.32	24.22	26.91
spr_ma4	0.00	0.00	17.14	21.46	10.57	9.50	14.43
spr_ma5	0.00	0.00	5.00	10.22	4.64	3.77	2.84
ma1aut2	0.00	0.00	0.00	13.24	52.17	3.14	60.97
ma2aut3	0.00	0.00	0.00	15.46	18.98	13.24	9.45
ma3aut4	0.00	0.00	0.00	10.22	10.02	4.27	14.21
ma4aut5	0.00	0.00	0.00	5.11	8.30	1.83	1.56
ma5aut6	0.00	0.00	0.00	1.14	1.39	0.77	0.14
	1987	1988	1989	1990	1991	1992	1993
spr_us1	0.12	0.20	0.05	0.00	0.03	0.06	0.33
spr_us2	0.72	0.99	1.59	0.57	0.71	0.34	0.84
spr_us3	1.18	0.84	1.27	2.65	1.63	1.15	1.16
spr_us4	0.81	0.76	0.86	1.02	2.33	0.88	1.58
spr_us5	0.61	0.31	0.49	0.54	0.92	1.07	0.61
spr_us6	0.29	0.23	0.29	0.17	0.15	0.43	0.45
spr_us7	0.19	0.12	0.16	0.06	0.07	0.11	0.17
spr_us8	0.09	0.01	0.03	0.04	0.04	0.04	0.08
us1aut2	0.51	0.53	2.84	0.48	1.52	0.47	0.65
us2aut3	1.48	1.27	2.97	4.45	2.26	2.48	1.23
us3aut4	0.89	0.99	2.39	2.86	7.49	2.03	1.85
us4aut5	1.45	0.43	0.78	0.98	2.89	1.59	1.28
us5aut6	0.47	0.69	0.47	0.19	0.59	0.73	0.78
us6aut7	0.43	0.25	0.10	0.10	0.25	0.30	0.30
us7aut8	0.16	0.10	0.07	0.02	0.11	0.04	0.07
spr_ma1	34.36	81.47	8.07	7.73	2.10	8.20	11.60
spr_ma2	17.26	63.57	127.26	25.37	19.98	11.06	18.98
spr_ma3	15.79	17.85	44.97	56.71	34.77	33.98	16.08
spr_ma4	3.90	8.72	11.99	16.48	18.98	14.99	9.16
spr_ma5	1.76	1.54	3.03	3.43	3.24	7.42	3.45
ma1aut2	41.27	46.36	85.63	57.56	31.99	24.07	46.33
ma2aut3	40.08	14.60	41.28	122.25	14.20	90.36	13.00
ma3aut4	12.07	3.00	13.98	31.03	20.12	40.05	29.79
ma4aut5	5.30	0.52	1.34	2.33	3.93	11.51	11.04
ma5aut6	0.39	0.23	0.45	0.13	0.21	1.17	1.38
	1994	1995	1996	1997	1998	Average	
spr_us1	0.03	0.31	0.02	0.02	0.06	0.124	
spr_us2	1.43	1.97	0.47	0.85	0.19	1.240	
spr_us3	1.14	3.21	1.94	1.67	1.02	1.825	

spr_us4	1.12	2.31	3.30	2.51	1.12	1.871
spr_us5	0.75	1.11	1.31	2.06	1.22	1.260
spr_us6	0.23	0.44	0.53	0.39	0.68	0.625
spr_us7	0.10	0.22	0.20	0.09	0.16	0.348
spr_us8	0.03	0.03	0.05	0.01	0.06	0.156
us1aut2	1.71	3.83	0.50	0.54	0.36	0.989
us2aut3	2.35	7.53	3.80	0.81	1.05	2.316
us3aut4	3.47	2.81	3.82	2.00	1.55	2.500
us4aut5	2.28	1.71	2.50	2.74	1.89	1.803
us5aut6	1.05	1.30	0.90	0.93	1.03	0.932
us6aut7	0.80	0.04	0.22	0.39	0.30	0.452
us7aut8	0.11	0.25	0.04	0.07	0.04	0.200
spr_ma1	11.60	0.54	2.29	1.55	0.00	14.336
spr_ma2	52.57	34.65	4.14	7.96	0.00	37.855
spr_ma3	22.12	49.64	14.92	13.95	0.00	28.063
spr_ma4	7.13	10.33	31.39	17.24	0.00	13.963
spr_ma5	3.88	3.16	6.33	12.21	0.00	4.744
ma1aut2	76.21	36.71	11.84	16.25	13.61	38.584
ma2aut3	36.80	79.31	44.22	19.25	28.08	37.535
ma3aut4	17.59	10.76	24.93	27.56	17.91	17.969
ma4aut5	6.85	2.91	4.21	13.97	10.29	5.688
ma5aut6	1.71	1.56	0.91	1.39	1.46	0.901

Catch at age (thousands) - C:\Program Files\WHAT\ap\ap90.41

	1980	1981	1982	1983	1984	1985	1986
1	11	39	59	16	50	60	122
2	183	1003	759	476	283	359	352
3	1063	2054	3047	1236	810	645	781
4	2636	4882	4268	4866	2144	1072	1497
5	3930	5288	4431	4776	5625	2175	1606
6	3933	3651	3536	3884	3175	2822	1467
7	3632	2404	3293	2265	1930	2214	1307
8	1185	1581	2038	1272	577	1081	631
9	3369	1706	2710	2062	1350	887	460
1+	19942	22608	24141	20853	15944	11315	8223
	1987	1988	1989	1990	1991	1992	1993
1	101	172	132	68	13	37	107
2	612	624	1653	676	323	231	426
3	1174	1377	1831	3389	1001	1083	2032
4	1126	1556	1125	2664	4410	2222	4141
5	2011	1524	829	1369	3403	6810	3583
6	1328	1438	536	531	1123	2724	3139
7	894	543	753	291	321	819	1403
8	543	270	471	349	164	198	265
9	309	321	411	450	402	342	563
1+	8098	7825	7741	9787	11160	14466	15659
	1994	1995	1996	1997			
1	288	518	195	158			
2	506	1488	936	1375			
3	623	2285	1418	803			
4	2627	6503	4443	2739			
5	4459	4826	2958	3919			
6	1703	2001	1471	1701			
7	1288	654	549	718			
8	608	584	250	230			
9	688	315	224	335			
1+	12790	19174	12444	11978			

CAA Summary for ages 5 - 9

1980	1981	1982	1983	1984	1985	1986
16049	14630	16008	14259	12657	9179	5471
1987	1988	1989	1990	1991	1992	1993
5085	4096	3000	2990	5413	10893	8953
1994	1995	1996	1997			
8746	8380	5452	6903			

Weight at age (mid year) in kg - C:\Program Files\WHAT\ap\ap90.41

	1980	1981	1982	1983	1984	1985	1986
1	0.022	0.017	0.016	0.015	0.015	0.018	0.016
2	0.056	0.105	0.099	0.038	0.051	0.041	0.043
3	0.151	0.172	0.241	0.195	0.178	0.096	0.128
4	0.267	0.322	0.300	0.393	0.326	0.232	0.276
5	0.409	0.444	0.422	0.543	0.552	0.354	0.397
6	0.653	0.778	0.572	0.674	0.641	0.540	0.589
7	0.829	0.883	0.961	0.825	0.890	0.852	0.842
8	1.039	0.978	1.138	1.042	1.192	1.167	1.174
9	1.523	1.315	1.479	1.479	1.657	1.618	1.702
	1987	1988	1989	1990	1991	1992	1993
1	0.015	0.016	0.012	0.021	0.015	0.028	0.016
2	0.048	0.044	0.041	0.058	0.053	0.065	0.078
3	0.159	0.180	0.135	0.138	0.120	0.159	0.212
4	0.262	0.311	0.275	0.265	0.330	0.315	0.304
5	0.439	0.462	0.446	0.455	0.498	0.485	0.434
6	0.612	0.643	0.566	0.639	0.710	0.717	0.590
7	0.893	0.892	0.736	0.824	0.960	0.948	0.936
8	1.173	1.231	0.857	0.968	1.161	1.202	1.234
9	1.688	1.630	1.537	1.352	1.479	1.617	1.647
	1994	1995	1996	1997			
1	0.014	0.012	0.014	0.014			
2	0.028	0.027	0.038	0.021			
3	0.194	0.203	0.110	0.111			
4	0.328	0.322	0.338	0.316			
5	0.418	0.453	0.474	0.402			
6	0.564	0.646	0.637	0.605			
7	0.763	0.909	0.902	0.746			
8	1.083	1.166	1.172	0.951			
9	1.807	1.399	1.657	1.565			

January 1 Biomass Weights - C:\Program Files\WHAT\ap\ap90.41

	1980	1981	1982	1983	1984	1985	1986
1	0.010	0.007	0.010	0.008	0.009	0.012	0.009
2	0.032	0.048	0.041	0.025	0.028	0.025	0.028
3	0.103	0.098	0.159	0.139	0.082	0.070	0.072
4	0.207	0.221	0.227	0.308	0.252	0.203	0.163
5	0.297	0.344	0.369	0.404	0.466	0.340	0.303
6	0.562	0.564	0.504	0.533	0.590	0.546	0.457
7	0.763	0.759	0.865	0.687	0.775	0.739	0.674
8	0.928	0.900	1.002	1.001	0.992	1.019	1.000
9	1.523	1.315	1.479	1.479	1.657	1.618	1.702
	1987	1988	1989	1990	1991	1992	1993
1	0.009	0.010	0.005	0.013	0.007	0.017	0.012
2	0.028	0.026	0.026	0.026	0.033	0.031	0.047
3	0.083	0.093	0.077	0.075	0.083	0.092	0.117

4	0.183	0.222	0.222	0.189	0.213	0.194	0.220
5	0.348	0.348	0.372	0.354	0.363	0.400	0.370
6	0.493	0.531	0.511	0.534	0.568	0.598	0.535
7	0.725	0.739	0.688	0.683	0.783	0.820	0.819
8	0.994	1.048	0.874	0.844	0.978	1.074	1.082
9	1.688	1.630	1.537	1.352	1.479	1.617	1.647

	1994	1995	1996	1997
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1	0.010	0.007	0.011	0.011
2	0.021	0.019	0.021	0.017
3	0.123	0.075	0.054	0.065
4	0.264	0.250	0.262	0.186
5	0.356	0.385	0.391	0.369
6	0.495	0.520	0.537	0.536
7	0.671	0.716	0.763	0.689
8	1.007	0.943	1.032	0.926
9	1.807	1.399	1.657	1.565

SSB Weights - C:\Program Files\WHAT\ap\ap90.41

	1980	1981	1982	1983	1984	1985	1986
--	------	------	------	------	------	------	------

1	0.010	0.007	0.010	0.008	0.009	0.012	0.009
2	0.032	0.048	0.041	0.025	0.028	0.025	0.028
3	0.103	0.098	0.159	0.139	0.082	0.070	0.072
4	0.207	0.221	0.227	0.308	0.252	0.203	0.163
5	0.297	0.344	0.369	0.404	0.466	0.340	0.303
6	0.562	0.564	0.504	0.533	0.590	0.546	0.457
7	0.763	0.759	0.865	0.687	0.775	0.739	0.674
8	0.928	0.900	1.002	1.001	0.992	1.019	1.000
9	1.523	1.315	1.479	1.479	1.657	1.618	1.702

	1987	1988	1989	1990	1991	1992	1993
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1	0.009	0.010	0.005	0.013	0.007	0.017	0.012
2	0.028	0.026	0.026	0.026	0.033	0.031	0.047
3	0.083	0.093	0.077	0.075	0.083	0.092	0.117
4	0.183	0.222	0.222	0.189	0.213	0.194	0.220
5	0.348	0.348	0.372	0.354	0.363	0.400	0.370
6	0.493	0.531	0.511	0.534	0.568	0.598	0.535
7	0.725	0.739	0.688	0.683	0.783	0.820	0.819
8	0.994	1.048	0.874	0.844	0.978	1.074	1.082
9	1.688	1.630	1.537	1.352	1.479	1.617	1.647

	1994	1995	1996	1997
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1	0.010	0.007	0.011	0.011
2	0.021	0.019	0.021	0.017
3	0.123	0.075	0.054	0.065
4	0.264	0.250	0.262	0.186
5	0.356	0.385	0.391	0.369
6	0.495	0.520	0.537	0.536
7	0.671	0.716	0.763	0.689
8	1.007	0.943	1.032	0.926
9	1.807	1.399	1.657	1.565

Computed (Rivard) from midyear weights: Jan 1 Weights - C:\Program Files\WHAT\ap\ap90.41

	1980	1981	1982	1983	1984	1985	1986
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1	0.010	0.007	0.010	0.008	0.009	0.012	0.009
2	0.032	0.048	0.041	0.025	0.028	0.025	0.028
3	0.103	0.098	0.159	0.139	0.082	0.070	0.072
4	0.207	0.221	0.227	0.308	0.252	0.203	0.163
5	0.297	0.344	0.369	0.404	0.466	0.340	0.303
6	0.562	0.564	0.504	0.533	0.590	0.546	0.457
7	0.763	0.759	0.865	0.687	0.775	0.739	0.674

8	0.928	0.900	1.002	1.001	0.992	1.019	1.000
9	1.523	1.315	1.479	1.479	1.657	1.618	1.702
	1987	1988	1989	1990	1991	1992	1993
1	0.009	0.010	0.005	0.013	0.007	0.017	0.012
2	0.028	0.026	0.026	0.026	0.033	0.031	0.047
3	0.083	0.093	0.077	0.075	0.083	0.092	0.117
4	0.183	0.222	0.222	0.189	0.213	0.194	0.220
5	0.348	0.348	0.372	0.354	0.363	0.400	0.370
6	0.493	0.531	0.511	0.534	0.568	0.598	0.535
7	0.725	0.739	0.688	0.683	0.783	0.820	0.819
8	0.994	1.048	0.874	0.844	0.978	1.074	1.082
9	1.688	1.630	1.537	1.352	1.479	1.617	1.647
	1994	1995	1996	1997	1998		
1	0.010	0.007	0.011	0.011	0.010		
2	0.021	0.019	0.021	0.017	0.017		
3	0.123	0.075	0.054	0.065	0.026		
4	0.264	0.250	0.262	0.186	0.190		
5	0.356	0.385	0.391	0.369	0.536		
6	0.495	0.520	0.537	0.536	0.438		
7	0.671	0.716	0.763	0.689	0.684		
8	1.007	0.943	1.032	0.926	0.807		
9	1.807	1.399	1.657	1.565	1.565		

Percent Mature (females)-	C:\Program Files\WHAT\ap\ap90.41						
1980	1981	1982	1983	1984	1985	1986	
1	00	00	00	00	00	00	00
2	04	04	04	04	04	04	04
3	24	24	24	24	24	24	24
4	72	72	72	72	72	72	72
5	95	95	95	95	95	95	95
6	99	99	99	99	99	99	99
7	100	100	100	100	100	100	100
8	100	100	100	100	100	100	100
9	100	100	100	100	100	100	100
	1987	1988	1989	1990	1991	1992	1993
1	00	00	00	00	00	00	00
2	04	04	04	04	04	04	04
3	24	24	24	24	24	24	24
4	72	72	72	72	72	72	72
5	95	95	95	95	95	95	95
6	99	99	99	99	99	99	99
7	100	100	100	100	100	100	100
8	100	100	100	100	100	100	100
9	100	100	100	100	100	100	100
	1994	1995	1996	1997			
1	00	00	00	00			
2	04	04	04	04			
3	24	24	24	24			
4	72	72	72	72			
5	95	95	95	95			
6	99	99	99	99			
7	100	100	100	100			
8	100	100	100	100			
9	100	100	100	100			

Sex Ratio (Percent Female) -	C:\Program Files\WHAT\ap\ap90.41						
1980	1981	1982	1983	1984	1985	1986	
1	0.5	0.5	0.5	0.5	0.5	0.5	0.5
2	0.5	0.5	0.5	0.5	0.5	0.5	0.5

3	0.5	0.5	0.5	0.5	0.5	0.5	0.5
4	0.5	0.5	0.5	0.5	0.5	0.5	0.5
5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
6	0.5	0.5	0.5	0.5	0.5	0.5	0.5
7	0.5	0.5	0.5	0.5	0.5	0.5	0.5
8	0.5	0.5	0.5	0.5	0.5	0.5	0.5
9	0.5	0.5	0.5	0.5	0.5	0.5	0.5

	1987	1988	1989	1990	1991	1992	1993
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1	0.5	0.5	0.5	0.5	0.5	0.5	0.5
2	0.5	0.5	0.5	0.5	0.5	0.5	0.5
3	0.5	0.5	0.5	0.5	0.5	0.5	0.5
4	0.5	0.5	0.5	0.5	0.5	0.5	0.5
5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
6	0.5	0.5	0.5	0.5	0.5	0.5	0.5
7	0.5	0.5	0.5	0.5	0.5	0.5	0.5
8	0.5	0.5	0.5	0.5	0.5	0.5	0.5
9	0.5	0.5	0.5	0.5	0.5	0.5	0.5

	1994	1995	1996	1997
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1	0.5	0.5	0.5	0.5
2	0.5	0.5	0.5	0.5
3	0.5	0.5	0.5	0.5
4	0.5	0.5	0.5	0.5
5	0.5	0.5	0.5	0.5
6	0.5	0.5	0.5	0.5
7	0.5	0.5	0.5	0.5
8	0.5	0.5	0.5	0.5
9	0.5	0.5	0.5	0.5

pF is 0.2500

pM is 0.2500

Residual Sum of Squares from Marquardt Algorithm

Number 18

RSS 144.329267821391

Lambda 1.00E+02

RESULTS

Approximate Statistics Assuming Linearity Near Solution

Sum of Squares: 144.329267821391

Mean Square Residuals: 0.35637

	PAR.	EST.	STD.	ERR.	T-STATISTIC	C.V.
N 2	6.30E+03	1.76E+03	3.57E+00	0.28		
N 3	8.66E+03	1.96E+03	4.42E+00	0.23		
N 4	7.41E+03	1.42E+03	5.20E+00	0.19		
N 5	1.31E+04	2.39E+03	5.49E+00	0.18		
N 6	1.23E+04	2.35E+03	5.25E+00	0.19		
N 7	2.43E+03	6.95E+02	3.50E+00	0.29		
N 8	6.98E+02	2.47E+02	2.82E+00	0.35		
q spr_us1	2.24E-05	3.31E-06	6.76E+00	0.15		
q spr_us2	3.36E-05	4.70E-06	7.15E+00	0.14		
q spr_us3	4.47E-05	6.22E-06	7.19E+00	0.14		
q spr_us4	5.70E-05	7.90E-06	7.21E+00	0.14		
q spr_us5	7.95E-05	1.10E-05	7.22E+00	0.14		
q spr_us6	1.34E-04	1.86E-05	7.20E+00	0.14		
q spr_us7	2.16E-04	3.03E-05	7.14E+00	0.14		
q spr_us8	3.22E-04	4.54E-05	7.09E+00	0.14		
q us1aut2	3.51E-05	5.05E-06	6.95E+00	0.14		
q us2aut3	4.67E-05	6.68E-06	6.99E+00	0.14		
q us3aut4	6.21E-05	8.85E-06	7.02E+00	0.14		
q us4aut5	8.97E-05	1.28E-05	7.02E+00	0.14		
q us5aut6	1.63E-04	2.32E-05	7.01E+00	0.14		
q us6aut7	2.68E-04	3.86E-05	6.95E+00	0.14		

q us7aut8	4.35E-04	6.32E-05	6.89E+00	0.15
q spr_ma1	1.95E-05	2.98E-06	6.55E+00	0.15
q spr_ma2	3.32E-05	5.04E-06	6.59E+00	0.15
q spr_ma3	5.15E-05	7.79E-06	6.62E+00	0.15
q spr_ma4	6.30E-05	9.50E-06	6.63E+00	0.15
q spr_ma5	9.10E-05	1.37E-05	6.64E+00	0.15
q ma1aut2	3.97E-05	6.07E-06	6.54E+00	0.15
q ma2aut3	4.56E-05	6.93E-06	6.58E+00	0.15
q ma3aut4	6.26E-05	9.47E-06	6.61E+00	0.15
q ma4aut5	7.81E-05	1.18E-05	6.61E+00	0.15
q ma5aut6	1.51E-04	2.28E-05	6.60E+00	0.15

Catchability Estimates in Original Units

	Estimate	Std.Err.	C.V.
q spr_us1	2.79E-06	4.12E-07	0.15
q spr_us2	4.17E-05	5.83E-06	0.14
q spr_us3	8.16E-05	1.13E-05	0.14
q spr_us4	1.07E-04	1.48E-05	0.14
q spr_us5	1.00E-04	1.39E-05	0.14
q spr_us6	8.36E-05	1.16E-05	0.14
q spr_us7	7.52E-05	1.05E-05	0.14
q spr_us8	5.03E-05	7.09E-06	0.14
q us1aut2	3.47E-05	4.99E-06	0.14
q us2aut3	1.08E-04	1.55E-05	0.14
q us3aut4	1.55E-04	2.21E-05	0.14
q us4aut5	1.62E-04	2.30E-05	0.14
q us5aut6	1.52E-04	2.16E-05	0.14
q us6aut7	1.21E-04	1.75E-05	0.14
q us7aut8	8.70E-05	1.26E-05	0.15
q spr_ma1	2.80E-04	4.27E-05	0.15
q spr_ma2	1.26E-03	1.91E-04	0.15
q spr_ma3	1.45E-03	2.19E-04	0.15
q spr_ma4	8.80E-04	1.33E-04	0.15
q spr_ma5	4.32E-04	6.50E-05	0.15
q ma1aut2	1.53E-03	2.34E-04	0.15
q ma2aut3	1.71E-03	2.60E-04	0.15
q ma3aut4	1.12E-03	1.70E-04	0.15
q ma4aut5	4.44E-04	6.72E-05	0.15
q ma5aut6	1.36E-04	2.06E-05	0.15

Summary of Residuals

spr_us

Tuned to: 1-Jan

For ages: 1

Year	Obs.	Pred.	Scd.	Obs.	Scd.	Pred.Wt.	Wt.	Res.	Std. Res.	Pred.	Stk.	Sze.
1980	0.570	1.135	1.522	0.126	1	1	1.395	2.337	50702			
1981	0.130	0.534	0.044	-0.628	1	0	0.671	1.124	23856			
1982	0.060	0.461	-0.730	-0.774	1	0	0.045	0.075	20595			
1983	0.200	0.487	0.474	-0.720	1	0	1.194	2.000	21754			
1984	0.020	0.285	-1.828	-1.254	1	0	-0.574	-0.961	12745			
1985	0.030	0.275	-1.423	-1.290	1	0	-0.133	-0.223	12305			
1986	0.010	0.396	-2.521	-0.926	1	0	-1.595	-2.672	17694			
1987	0.120	0.815	-0.036	-0.205	1	0	0.168	0.282	36417			
1988	0.200	1.177	0.474	0.163	1	0	0.312	0.522	52580			
1989	0.050	0.591	-0.912	-0.527	1	0	-0.385	-0.645	26390			
1990	0.000	0.000	0	0	1	0	0.000	0.000	00			
1991	0.030	0.688	-1.423	-0.375	1	0	-1.048	-1.756	30720			
1992	0.060	0.788	-0.730	-0.238	1	0	-0.491	-0.823	35205			
1993	0.330	1.267	0.975	0.236	1	0	0.739	1.238	56601			
1994	0.030	0.881	-1.423	-0.126	1	0	-1.297	-2.172	39386			
1995	0.305	0.373	0.896	-0.986	1	0	1.883	3.154	16667			
1996	0.021	0.335	-1.779	-1.092	1	0	-0.687	-1.151	14990			
1997	0.018	0.176	-1.933	-1.736	1	0	-0.197	-0.330	7870			
1998	0.056	0.000	-0.799	0	1	0	0.000	0.000	00			

Partial Variance: 0.874

spr_us

Tuned to: 1-Jan

For ages: 2

Year	Obs.	Pred.	Scd.	Obs.	Scd.	Pred.Wt.	Wt.	Res.	Std.	Res.	Pred.	Stk.	Sze.
1980	3.550	1.386	1.052	0.326	1	0.725	1.215	41263					
1981	3.490	1.394	1.035	0.332	1	0.702	1.177	41501					
1982	1.040	0.655	-0.176	-0.423	1	0.247	0.414	19497					
1983	3.680	0.565	1.088	-0.572	1	1.659	2.779	16809					
1984	0.350	0.598	-1.265	-0.515	1	-0.751	-1.257	17796					
1985	0.320	0.349	-1.355	-1.053	1	-0.302	-0.506	10389					
1986	0.460	0.337	-0.992	-1.089	1	0.097	0.163	10020					
1987	0.720	0.483	-0.544	-0.728	1	0.184	0.308	14377					
1988	0.990	0.998	-0.225	-0.002	1	-0.224	-0.375	29724					
1989	1.590	1.441	0.248	0.365	1	-0.117	-0.196	42893					
1990	0.570	0.722	-0.777	-0.326	1	-0.451	-0.756	21487					
1991	0.710	0.889	-0.558	-0.118	1	-0.440	-0.737	26458					
1992	0.340	0.844	-1.294	-0.169	1	-1.125	-1.885	25139					
1993	0.840	0.967	-0.390	-0.034	1	-0.356	-0.597	28790					
1994	1.430	1.553	0.142	0.440	1	-0.298	-0.499	46244					
1995	1.974	1.074	0.465	0.072	1	0.393	0.658	31986					
1996	0.470	0.443	-0.970	-0.815	1	-0.155	-0.260	13177					
1997	0.850	0.406	-0.378	-0.901	1	0.523	0.876	12097					
1998	0.192	0.212	-1.866	-1.553	1	-0.313	-0.524	6301					

Partial Variance: 0.396

spr_us

Tuned to: 1-Jan

For ages: 3

Year	Obs.	Pred.	Scd.	Obs.	Scd.	Pred.Wt.	Wt.	Res.	Std.	Res.	Pred.	Stk.	Sze.
1980	4.490	1.598	0.901	0.469	1	0.432	0.724	35738					
1981	4.310	1.503	0.860	0.407	1	0.452	0.757	33618					
1982	1.790	1.479	-0.019	0.391	1	-0.410	-0.687	33071					
1983	3.330	0.683	0.602	-0.381	1	0.983	1.647	15276					
1984	0.570	0.596	-1.163	-0.518	1	-0.646	-1.082	13331					
1985	0.980	0.640	-0.622	-0.446	1	-0.175	-0.293	14314					
1986	0.340	0.366	-1.680	-1.006	1	-0.674	-1.130	8181					
1987	1.180	0.353	-0.436	-1.043	1	0.607	1.016	7885					
1988	0.840	0.501	-0.776	-0.690	1	-0.085	-0.143	11217					
1989	1.270	1.063	-0.362	0.061	1	-0.423	-0.709	23771					
1990	2.650	1.503	0.373	0.408	1	-0.034	-0.058	33622					
1991	1.630	0.759	-0.113	-0.276	1	0.163	0.273	16980					
1992	1.150	0.955	-0.462	-0.046	1	-0.416	-0.697	21370					
1993	1.160	0.911	-0.453	-0.093	1	-0.360	-0.602	20373					
1994	1.140	1.037	-0.470	0.036	1	-0.506	-0.848	23186					
1995	3.212	1.672	0.566	0.514	1	0.051	0.086	37404					
1996	1.935	1.111	0.059	0.105	1	-0.046	-0.077	24842					
1997	1.671	0.444	-0.088	-0.811	1	0.723	1.211	9942					
1998	1.018	0.387	-0.583	-0.949	1	0.365	0.612	8660					

Partial Variance: 0.239

spr_us

Tuned to: 1-Jan

For ages: 4

Year	Obs.	Pred.	Scd.	Obs.	Scd.	Pred.Wt.	Wt.	Res.	Std.	Res.	Pred.	Stk.	Sze.
1980	3.000	1.374	0.472	0.318	1	0.154	0.258	24117					
1981	3.550	1.612	0.640	0.478	1	0.163	0.272	28298					
1982	3.170	1.462	0.527	0.380	1	0.147	0.246	25665					
1983	4.480	1.386	0.873	0.326	1	0.547	0.916	24319					
1984	0.900	0.649	-0.732	-0.432	1	-0.300	-0.502	11388					
1985	0.860	0.580	-0.777	-0.544	1	-0.233	-0.390	10182					
1986	1.010	0.635	-0.617	-0.455	1	-0.162	-0.271	11136					
1987	0.810	0.341	-0.837	-1.075	1	0.237	0.398	5991					
1988	0.760	0.307	-0.901	-1.180	1	0.279	0.467	5394					
1989	0.860	0.452	-0.777	-0.793	1	0.016	0.027	7938					
1990	1.020	1.015	-0.607	0.014	1	-0.621	-1.041	17806					
1991	2.330	1.394	0.219	0.332	1	-0.113	-0.189	24461					
1992	0.880	0.741	-0.754	-0.300	1	-0.454	-0.761	12997					
1993	1.580	0.941	-0.169	-0.061	1	-0.109	-0.182	16516					
1994	1.120	0.846	-0.513	-0.168	1	-0.346	-0.579	14842					
1995	2.307	1.050	0.209	0.048	1	0.161	0.270	18419					
1996	3.296	1.627	0.566	0.487	1	0.079	0.133	28556					
1997	2.506	1.086	0.292	0.082	1	0.210	0.351	19056					
1998	1.116	0.422	-0.517	-0.862	1	0.345	0.578	7413					

Partial Variance: 0.091

spr_us

Tuned to: 1-Jan

For ages: 5

Year	Obs.	Pred.	Scd.	Obs.	Scd.	Pred.Wt.	Wt.	Res.	Std.	Res.	Pred.	Stk.	Sze.
1980	2.890	1.721	0.830	0.543	1	0.287	0.481	21641					
1981	2.670	1.381	0.751	0.323	1	0.428	0.717	17360					
1982	2.130	1.491	0.525	0.400	1	0.125	0.210	18751					
1983	2.640	1.364	0.740	0.311	1	0.429	0.719	17151					
1984	1.300	1.233	0.031	0.210	1	-0.179	-0.299	15508					
1985	0.730	0.587	-0.546	-0.532	1	-0.014	-0.023	7384					
1986	0.590	0.586	-0.759	-0.535	1	-0.224	-0.376	7366					
1987	0.610	0.617	-0.726	-0.482	1	-0.243	-0.408	7763					
1988	0.310	0.309	-1.402	-1.174	1	-0.228	-0.383	3887					
1989	0.490	0.239	-0.945	-1.430	1	0.486	0.813	3008					
1990	0.540	0.436	-0.847	-0.830	1	-0.017	-0.029	5481					
1991	0.920	0.968	-0.315	-0.033	1	-0.282	-0.472	12167					
1992	1.070	1.276	-0.164	0.243	1	-0.407	-0.682	16037					
1993	0.610	0.686	-0.726	-0.376	1	-0.349	-0.585	8630					
1994	0.750	0.778	-0.519	-0.252	1	-0.267	-0.448	9775					
1995	1.109	0.777	-0.128	-0.252	1	0.124	0.208	9774					
1996	1.309	0.731	0.038	-0.313	1	0.351	0.588	9196					
1997	2.057	1.540	0.490	0.432	1	0.058	0.098	19360					
1998	1.219	1.044	-0.033	0.043	1	-0.076	-0.128	13123					

Partial Variance: 0.084

spr_us

Tuned to: 1-Jan

For ages: 6

Year	Obs.	Pred.	Scd.	Obs.	Scd.	Pred.Wt.	Wt.	Res.	Std.	Res.	Pred.	Stk.	Sze.
1980	1.600	2.322	0.941	0.842	1	0.098	0.165	17355					
1981	1.740	1.895	1.025	0.639	1	0.386	0.646	14162					
1982	1.340	1.261	0.763	0.232	1	0.531	0.890	9428					
1983	1.180	1.517	0.636	0.417	1	0.219	0.367	11343					
1984	0.580	1.300	-0.074	0.263	1	-0.337	-0.564	9721					
1985	0.860	0.018	0.320	0.018	1	0.302	0.506	7607					
1986	0.290	0.545	-0.767	-0.606	1	-0.161	-0.270	4077					
1987	0.290	0.612	-0.767	-0.490	1	-0.277	-0.464	4578					
1988	0.230	0.607	-0.999	-0.499	1	-0.500	-0.837	4536					
1989	0.290	0.241	-0.767	-1.422	1	0.655	1.097	1803					
1990	0.170	0.229	-1.301	-1.474	1	0.172	0.289	1713					
1991	0.150	0.435	-1.426	-0.833	1	-0.593	-0.994	3249					
1992	0.430	0.921	-0.373	-0.083	1	-0.291	-0.487	6883					
1993	0.450	0.932	-0.328	-0.070	1	-0.258	-0.432	6968					
1994	0.230	0.512	-0.999	-0.670	1	-0.329	-0.551	3824					
1995	0.437	0.531	-0.357	-0.633	1	0.276	0.462	3969					
1996	0.529	0.486	-0.166	-0.721	1	0.555	0.929	3636					
1997	0.391	0.649	-0.468	-0.432	1	-0.036	-0.061	4853					
1998	0.680	1.646	0.085	0.498	1	-0.413	-0.692	12304					

Partial Variance: 0.151

spr_us

Tuned to: 1-Jan

For ages: 7

Year	Obs.	Pred.	Scd.	Obs.	Scd.	Pred.Wt.	Wt.	Res.	Std.	Res.	Pred.	Stk.	Sze.
1980	1.120	2.409	1.170	0.879	1	0.290	0.487	11140					
1981	1.450	2.303	1.428	0.834	1	0.594	0.994	10650					
1982	0.920	1.793	0.973	0.584	1	0.389	0.652	8291					
1983	0.580	0.978	0.512	-0.023	1	0.534	0.895	4520					
1984	0.220	1.248	-0.458	0.222	1	-0.680	-1.138	5772					
1985	0.460	1.100	0.280	0.095	1	0.185	0.309	5086					
1986	0.210	0.795	-0.504	-0.230	1	-0.274	-0.460	3675					
1987	0.190	0.435	-0.604	-0.833	1	0.228	0.382	2011					
1988	0.120	0.551	-1.064	-0.597	1	-0.467	-0.783	2546					
1989	0.160	0.522	-0.776	-0.650	1	-0.126	-0.211	2413					
1990	0.060	0.214	-1.757	-1.540	1	-0.217	-0.363	991					
1991	0.070	0.199	-1.603	-1.613	1	0.010	0.017	922					
1992	0.110	0.355	-1.151	-1.034	1	-0.117	-0.195	1644					
1993	0.170	0.686	-0.715	-0.377	1	-0.338	-0.566	3170					

1994	0.098	0.620	-1.266	-0.479	1	-0.788	-1.319	2865
1995	0.216	0.344	-0.476	-1.068	1	0.592	0.991	1590
1996	0.203	0.311	-0.538	-1.167	1	0.629	1.054	1439
1997	0.093	0.356	-1.319	-1.033	1	-0.286	-0.479	1646
1998	0.156	0.526	-0.801	-0.642	1	-0.160	-0.268	2434

Partial Variance: 0.191

spr_us

Tuned to: 1-Jan

For ages: 8

Year	Obs.	Pred.	Scd.	Obs.	Scd.	Pred.Wt.	Wt.	Res.	Std.	Res.	Pred.	Stk.	Sze.
1980	0.250	1.652	0.470	0.502	1	-0.032	-0.054	5135					
1981	0.790	1.877	1.620	0.630	1	0.991	1.659	5834					
1982	0.490	2.105	1.143	0.744	1	0.398	0.667	6545					
1983	0.320	1.225	0.716	0.203	1	0.513	0.860	3809					
1984	0.100	0.531	-0.447	-0.633	1	0.186	0.312	1651					
1985	0.420	0.959	0.988	-0.042	1	1.031	1.727	2980					
1986	0.100	0.695	-0.447	-0.364	1	-0.083	-0.139	2160					
1987	0.090	0.587	-0.552	-0.532	1	-0.020	-0.033	1826					
1988	0.010	0.269	-2.749	-1.312	1	-1.438	-2.408	837					
1989	0.030	0.513	-1.651	-0.668	1	-0.982	-1.646	1593					
1990	0.040	0.416	-1.363	-0.876	1	-0.487	-0.815	1294					
1991	0.040	0.176	-1.363	-1.735	1	0.372	0.623	548					
1992	0.040	0.149	-1.363	-1.902	1	0.539	0.902	464					
1993	0.080	0.194	-0.670	-1.637	1	0.968	1.621	605					
1994	0.030	0.427	-1.651	-0.852	1	-0.799	-1.338	1326					
1995	0.026	0.380	-1.794	-0.969	1	-0.825	-1.382	1180					
1996	0.045	0.228	-1.245	-1.477	1	0.232	0.388	710					
1997	0.012	0.219	-2.567	-1.518	1	-1.049	-1.757	681					
1998	0.057	0.224	-1.009	-1.494	1	0.485	0.813	698					

Partial Variance: 0.556

us1aut

Tuned to: 1-Jan

For ages: 2

Year	Obs.	Pred.	Scd.	Obs.	Scd.	Pred.Wt.	Wt.	Res.	Std.	Res.	Pred.	Stk.	Sze.
1980	0.000	0.000	0	0	1	0.000	0.000	00					
1981	1.580	1.457	0.469	0.377	1	0.092	0.154	41501					
1982	0.430	0.685	-0.833	-0.379	1	-0.454	-0.760	19497					
1983	0.200	0.590	-1.598	-0.527	1	-1.071	-1.794	16809					
1984	0.500	0.625	-0.682	-0.470	1	-0.212	-0.355	17796					
1985	0.220	0.365	-1.503	-1.008	1	-0.494	-0.828	10389					
1986	0.920	0.352	-0.072	-1.044	1	0.973	1.629	10020					
1987	0.510	0.505	-0.662	-0.683	1	0.022	0.036	14377					
1988	0.530	1.044	-0.623	0.043	1	-0.666	-1.116	29724					
1989	2.840	1.506	1.055	0.410	1	0.646	1.081	42893					
1990	0.480	0.755	-0.723	-0.282	1	-0.441	-0.739	21487					
1991	1.520	0.929	0.430	-0.073	1	0.504	0.844	26458					
1992	0.470	0.883	-0.744	-0.125	1	-0.619	-1.037	25139					
1993	0.650	1.011	-0.419	0.011	1	-0.430	-0.721	28790					
1994	1.710	1.624	0.548	0.485	1	0.063	0.106	46244					
1995	3.830	1.123	1.354	0.116	1	1.238	2.074	31986					
1996	0.500	0.463	-0.682	-0.771	1	0.089	0.149	13177					
1997	0.542	0.425	-0.601	-0.856	1	0.255	0.427	12097					
1998	0.363	0.221	-1.002	-1.508	1	0.507	0.848	6301					

Partial Variance: 0.379

us2aut

Tuned to: 1-Jan

For ages: 3

Year	Obs.	Pred.	Scd.	Obs.	Scd.	Pred.Wt.	Wt.	Res.	Std.	Res.	Pred.	Stk.	Sze.
1980	0.000	0.000	0	0	1	0.000	0.000	00					
1981	2.220	1.569	-0.042	0.451	1	-0.493	-0.825	33618					
1982	2.790	1.544	0.186	0.434	1	-0.248	-0.415	33071					
1983	0.910	0.713	-0.934	-0.338	1	-0.596	-0.998	15276					
1984	1.010	0.622	-0.830	-0.474	1	-0.355	-0.595	13331					
1985	2.240	0.668	-0.033	-0.403	1	0.370	0.620	14314					
1986	0.840	0.382	-1.014	-0.963	1	-0.051	-0.086	8181					
1987	1.480	0.368	-0.448	-1.000	1	0.552	0.924	7885					
1988	1.270	0.524	-0.601	-0.647	1	0.046	0.078	11217					

1989	2.970	1.110	0.249	0.104	1	0.145	0.243	23771
1990	4.450	1.569	0.653	0.451	1	0.202	0.339	33622
1991	2.260	0.793	-0.024	-0.232	1	0.208	0.349	16980
1992	2.480	0.997	0.068	-0.003	1	0.071	0.119	21370
1993	1.230	0.951	-0.633	-0.050	1	-0.582	-0.976	20373
1994	2.350	1.082	0.015	0.079	1	-0.064	-0.108	23186
1995	7.530	1.746	1.179	0.557	1	0.622	1.042	37404
1996	3.800	1.160	0.495	0.148	1	0.347	0.582	24842
1997	0.807	0.464	-1.054	-0.768	1	-0.286	-0.480	9942
1998	1.048	0.404	-0.793	-0.906	1	0.113	0.189	8660

Partial Variance: 0.137

us3aut

Tuned to: 1-Jan

For ages: 4

Year	Obs.	Pred.	Scd.	Obs.	Scd.	Pred.Wt.	Wt.	Res.	Std.	Res.	Pred.	Stk.	Sze.
1980	0.000	0.000	0	0	1	0.000	0.000	00					
1981	2.720	1.757	0.084	0.563	1	-0.479	-0.803	28298					
1982	2.220	1.593	-0.119	0.466	1	-0.585	-0.979	25665					
1983	1.650	1.510	-0.415	0.412	1	-0.827	-1.386	24319					
1984	2.020	0.707	-0.213	-0.347	1	0.134	0.224	11388					
1985	1.560	0.632	-0.472	-0.459	1	-0.013	-0.021	10182					
1986	2.680	0.691	0.070	-0.369	1	0.439	0.735	11136					
1987	0.890	0.372	-1.033	-0.989	1	-0.044	-0.073	5991					
1988	0.990	0.335	-0.926	-1.094	1	0.168	0.281	5394					
1989	2.390	0.493	-0.045	-0.708	1	0.663	1.110	7938					
1990	2.860	1.105	0.135	0.100	1	0.034	0.058	17806					
1991	7.490	1.519	1.097	0.418	1	0.680	1.138	24461					
1992	2.030	0.807	-0.208	-0.215	1	0.006	0.011	12997					
1993	1.850	1.025	-0.301	0.025	1	-0.326	-0.546	16516					
1994	3.470	0.921	0.328	-0.082	1	0.410	0.686	14842					
1995	2.810	1.143	0.117	0.134	1	-0.017	-0.029	18419					
1996	3.820	1.773	0.424	0.573	1	-0.149	-0.249	28556					
1997	1.998	1.183	-0.224	0.168	1	-0.392	-0.657	19056					
1998	1.550	0.460	-0.478	-0.776	1	0.298	0.499	7413					

Partial Variance: 0.176

us4aut

Tuned to: 1-Jan

For ages: 5

Year	Obs.	Pred.	Scd.	Obs.	Scd.	Pred.Wt.	Wt.	Res.	Std.	Res.	Pred.	Stk.	Sze.
1980	0.000	0.000	0	0	1	0.000	0.000	00					
1981	2.850	1.557	0.458	0.443	1	0.015	0.025	17360					
1982	2.620	1.682	0.374	0.520	1	-0.147	-0.246	18751					
1983	1.270	1.539	-0.351	0.431	1	-0.782	-1.309	17151					
1984	2.920	1.391	0.482	0.330	1	0.152	0.254	15508					
1985	1.210	0.662	-0.399	-0.412	1	0.013	0.021	7384					
1986	1.070	0.661	-0.522	-0.414	1	-0.108	-0.180	7366					
1987	1.450	0.696	-0.218	-0.362	1	0.144	0.241	7763					
1988	0.430	0.349	-1.434	-1.054	1	-0.380	-0.637	3887					
1989	0.780	0.270	-0.838	-1.310	1	0.472	0.790	3008					
1990	0.980	0.492	-0.610	-0.710	1	0.100	0.168	5481					
1991	2.890	1.092	0.472	0.088	1	0.384	0.643	12167					
1992	1.590	1.439	-0.126	0.364	1	-0.490	-0.820	16037					
1993	1.280	0.774	-0.343	-0.256	1	-0.087	-0.146	8630					
1994	2.280	0.877	0.235	-0.131	1	0.366	0.613	9775					
1995	1.710	0.877	-0.053	-0.131	1	0.078	0.131	9774					
1996	2.500	0.825	0.327	-0.192	1	0.519	0.869	9196					
1997	2.738	1.737	0.418	0.552	1	-0.134	-0.225	19360					
1998	1.892	1.177	0.048	0.163	1	-0.115	-0.193	13123					

Partial Variance: 0.114

us5aut

Tuned to: 1-Jan

For ages: 6

Year	Obs.	Pred.	Scd.	Obs.	Scd.	Pred.Wt.	Wt.	Res.	Std.	Res.	Pred.	Stk.	Sze.
1980	0.000	0.000	0	0	1	0.000	0.000	00					
1981	1.530	2.305	0.496	0.835	1	-0.339	-0.568	14162					
1982	2.300	1.535	0.904	0.428	1	0.475	0.796	9428					

1984	1.360	1.582	0.378	0.459	1	-0.081	-0.135	9721
1985	1.070	1.238	0.138	0.214	1	-0.075	-0.126	7607
1986	0.810	0.664	-0.140	-0.410	1	0.270	0.452	4077
1987	0.470	0.745	-0.684	-0.294	1	-0.390	-0.653	4578
1988	0.690	0.738	-0.300	-0.303	1	0.003	0.005	4536
1989	0.470	0.294	-0.684	-1.226	1	0.542	0.907	1803
1990	0.190	0.279	-1.590	-1.277	1	-0.313	-0.524	1713
1991	0.590	0.529	-0.457	-0.637	1	0.180	0.302	3249
1992	0.730	1.120	-0.244	0.114	1	-0.358	-0.599	6883
1993	0.780	1.134	-0.178	0.126	1	-0.304	-0.509	6968
1994	1.050	0.622	0.120	-0.474	1	0.594	0.995	3824
1995	1.300	0.646	0.333	-0.437	1	0.770	1.290	3969
1996	0.900	0.592	-0.035	-0.525	1	0.490	0.821	3636
1997	0.928	0.790	-0.004	-0.236	1	0.232	0.389	4853
1998	1.031	2.003	0.101	0.695	1	-0.593	-0.994	12304

Partial Variance: 0.241

us6aut

Tuned to: 1-Jan

For ages: 7

Year	Obs.	Pred.	Scd.	Obs.	Scd.	Pred.Wt.	Wt.	Res.	Std.	Res.	Pred.	Stk.	Sze.
1980	0.000	0.000	0	0	1	0.000	0.000	00					
1981	1.030	2.858	0.824	1.050	1	-0.227	-0.380	10650					
1982	1.550	2.225	1.232	0.800	1	0.432	0.724	8291					
1983	0.480	1.213	0.060	0.193	1	-0.133	-0.223	4520					
1984	0.680	1.549	0.408	0.438	1	-0.029	-0.049	5772					
1985	0.510	1.365	0.121	0.311	1	-0.190	-0.319	5086					
1986	0.410	0.986	-0.098	-0.014	1	-0.084	-0.140	3675					
1987	0.430	0.540	-0.050	-0.617	1	0.567	0.949	2011					
1988	0.250	0.683	-0.592	-0.381	1	-0.212	-0.355	2546					
1989	0.100	0.648	-1.509	-0.435	1	-1.074	-1.799	2413					
1990	0.100	0.266	-1.509	-1.324	1	-0.185	-0.309	991					
1991	0.250	0.247	-0.592	-1.397	1	0.805	1.348	922					
1992	0.300	0.441	-0.410	-0.818	1	0.408	0.684	1644					
1993	0.300	0.851	-0.410	-0.161	1	-0.249	-0.416	3170					
1994	0.800	0.769	0.571	-0.263	1	0.834	1.397	2865					
1995	0.040	0.427	-2.425	-0.852	1	-1.573	-2.635	1590					
1996	0.220	0.386	-0.720	-0.952	1	0.231	0.388	1439					
1997	0.386	0.442	-0.158	-0.817	1	0.659	1.104	1646					
1998	0.301	0.653	-0.407	-0.426	1	0.019	0.032	2434					

Partial Variance: 0.382

us7aut

Tuned to: 1-Jan

For ages: 8

Year	Obs.	Pred.	Scd.	Obs.	Scd.	Pred.Wt.	Wt.	Res.	Std.	Res.	Pred.	Stk.	Sze.
1980	0.000	0.000	0	0	1	0.000	0.000	00					
1981	0.930	2.540	1.538	0.932	1	0.606	1.015	5834					
1982	0.630	2.850	1.149	1.047	1	0.102	0.170	6545					
1983	0.300	1.658	0.407	0.506	1	-0.099	-0.166	3809					
1984	0.340	0.719	0.532	-0.330	1	0.862	1.444	1651					
1985	0.120	1.297	-0.509	0.260	1	-0.770	-1.290	2980					
1986	0.190	0.941	-0.050	-0.061	1	0.011	0.019	2160					
1987	0.160	0.795	-0.222	-0.229	1	0.008	0.013	1826					
1988	0.100	0.365	-0.692	-1.009	1	0.317	0.531	837					
1989	0.070	0.694	-1.048	-0.366	1	-0.683	-1.144	1593					
1990	0.020	0.563	-2.301	-0.574	1	-1.727	-2.894	1294					
1991	0.110	0.239	-0.596	-1.432	1	0.836	1.400	548					
1992	0.040	0.202	-1.608	-1.599	1	-0.009	-0.015	464					
1993	0.070	0.263	-1.048	-1.335	1	0.286	0.479	605					
1994	0.110	0.577	-0.596	-0.549	1	-0.047	-0.079	1326					
1995	0.250	0.514	0.225	-0.666	1	0.891	1.492	1180					
1996	0.040	0.309	-1.608	-1.174	1	-0.434	-0.727	710					
1997	0.072	0.297	-1.020	-1.215	1	0.195	0.327	681					
1998	0.043	0.304	-1.536	-1.191	1	-0.344	-0.577	698					

Partial Variance: 0.43

spr_ma

Tuned to: 1-Jan

For ages: 1

Year	Obs.	Pred.	Scd.	Obs.	Scd.	Pred.Wt.	Wt.	Res.	Std.	Res.	Pred.	Stk.	Sze.
1980	0.000	0.000	0	0	1	0.000	0.000	0.000	0.000	0.000	00		
1981	0.000	0.000	0	0	1	0.000	0.000	0.000	0.000	0.000	00		
1982	7.180	0.402	-0.691	-0.912	1	0.221	0.370	20595					
1983	1.930	0.424	-2.005	-0.857	1	-1.148	-1.923	21754					
1984	2.150	0.249	-1.897	-1.392	1	-0.505	-0.846	12745					
1985	21.560	0.240	0.408	-1.427	1	1.835	3.074	12305					
1986	27.060	0.345	0.635	-1.064	1	1.699	2.846	17694					
1987	34.360	0.710	0.874	-0.342	1	1.216	2.037	36417					
1988	81.470	1.025	1.737	0.025	1	1.712	2.868	52580					
1989	8.070	0.515	-0.575	-0.664	1	0.090	0.150	26390					
1990	7.730	0.632	-0.618	-0.459	1	-0.158	-0.265	32391					
1991	2.100	0.599	-1.921	-0.512	1	-1.409	-2.360	30720					
1992	8.198	0.687	-0.559	-0.376	1	-0.183	-0.306	35205					
1993	11.596	1.104	-0.212	0.099	1	-0.311	-0.521	56601					
1994	11.601	0.768	-0.212	-0.264	1	0.052	0.087	39386					
1995	0.541	0.325	-3.277	-1.124	1	-2.153	-3.607	16667					
1996	2.287	0.292	-1.836	-1.230	1	-0.606	-1.015	14990					
1997	1.548	0.153	-2.226	-1.874	1	-0.352	-0.589	7870					
1998	0.000	0.000	0	0	1	0.000	0.000	00					

Partial Variance: 1.329

spr_ma

Tuned to: 1-Jan

For ages: 2

Year	Obs.	Pred.	Scd.	Obs.	Scd.	Pred.Wt.	Wt.	Res.	Std.	Res.	Pred.	Stk.	Sze.
1980	0.000	0.000	0	0	1	0.000	0.000	00					
1981	0.000	0.000	0	0	1	0.000	0.000	00					
1982	49.250	0.648	0.263	-0.433	1	0.697	1.167	19497					
1983	18.760	0.559	-0.702	-0.582	1	-0.120	-0.201	16809					
1984	27.440	0.592	-0.322	-0.525	1	0.203	0.340	17796					
1985	17.160	0.345	-0.791	-1.063	1	0.272	0.455	10389					
1986	110.270	0.333	1.069	-1.099	1	2.168	3.632	10020					
1987	17.260	0.478	-0.785	-0.738	1	-0.047	-0.079	14377					
1988	63.570	0.988	0.518	-0.012	1	0.530	0.888	29724					
1989	127.260	1.426	1.212	0.355	1	0.857	1.436	42893					
1990	25.370	0.714	-0.400	-0.336	1	-0.064	-0.107	21487					
1991	19.980	0.880	-0.639	-0.128	1	-0.511	-0.856	26458					
1992	11.057	0.836	-1.231	-0.179	1	-1.051	-1.761	25139					
1993	18.981	0.957	-0.690	-0.044	1	-0.647	-1.083	28790					
1994	52.566	1.538	0.328	0.430	1	-0.102	-0.171	46244					
1995	34.650	1.064	-0.088	0.062	1	-0.150	-0.251	31986					
1996	4.143	0.438	-2.212	-0.825	1	-1.387	-2.324	13177					
1997	7.963	0.402	-1.559	-0.911	1	-0.648	-1.086	12097					
1998	0.000	0.000	0	0	1	0.000	0.000	00					

Partial Variance: 0.713

spr_ma

Tuned to: 1-Jan

For ages: 3

Year	Obs.	Pred.	Scd.	Obs.	Scd.	Pred.Wt.	Wt.	Res.	Std.	Res.	Pred.	Stk.	Sze.
1980	0.000	0.000	0	0	1	0.000	0.000	00					
1981	0.000	0.000	0	0	1	0.000	0.000	00					
1982	33.350	1.705	0.173	0.533	1	-0.361	-0.604	33071					
1983	22.420	0.787	-0.225	-0.239	1	0.015	0.024	15276					
1984	21.320	0.687	-0.275	-0.375	1	0.100	0.168	13331					
1985	24.220	0.738	-0.147	-0.304	1	0.157	0.263	14314					
1986	26.910	0.422	-0.042	-0.863	1	0.821	1.376	8181					
1987	15.790	0.406	-0.575	-0.900	1	0.325	0.545	7885					
1988	17.850	0.578	-0.452	-0.548	1	0.095	0.160	11217					
1989	44.970	1.225	0.472	0.203	1	0.268	0.450	23771					
1990	56.710	1.733	0.703	0.550	1	0.154	0.257	33622					
1991	34.770	0.875	0.214	-0.133	1	0.348	0.582	16980					
1992	33.979	1.102	0.191	0.097	1	0.095	0.158	21370					
1993	16.083	1.050	-0.557	0.049	1	-0.606	-1.015	20373					
1994	22.124	1.195	-0.238	0.178	1	-0.416	-0.697	23186					
1995	49.644	1.928	0.570	0.656	1	-0.086	-0.144	37404					
1996	14.921	1.280	-0.632	0.247	1	-0.879	-1.472	24842					
1997	13.950	0.512	-0.699	-0.669	1	-0.030	-0.051	9942					
1998	0.000	0.000	0	0	1	0.000	0.000	00					

Partial Variance: 0.17

spr_ma

Tuned to: 1-Jan

For ages: 4

Year	Obs.	Pred.	Scd.	Obs.	Scd.	Pred.Wt.	Wt.	Res.	Std.	Res.	Pred.	Stk.	Sze.
1980	0.000	0.000	0	0	1	0.000	0.000	00				00	
1981	0.000	0.000	0	0	1	0.000	0.000	00				00	
1982	17.140	1.618	0.205	0.481	1	-0.276	-0.462	25665					
1983	21.460	1.533	0.430	0.427	1	0.003	0.005	24319					
1984	10.570	0.718	-0.278	-0.332	1	0.053	0.089	11388					
1985	9.500	0.642	-0.385	-0.444	1	0.059	0.098	10182					
1986	14.430	0.702	0.033	-0.354	1	0.387	0.648	11136					
1987	3.900	0.378	-1.275	-0.974	1	-0.302	-0.505	5991					
1988	8.720	0.340	-0.471	-1.079	1	0.608	1.019	5394					
1989	11.990	0.500	-0.152	-0.693	1	0.540	0.905	7938					
1990	16.480	1.122	0.166	0.115	1	0.050	0.085	17806					
1991	18.980	1.542	0.307	0.433	1	-0.126	-0.211	24461					
1992	14.992	0.819	0.071	-0.200	1	0.271	0.453	12997					
1993	9.159	1.041	-0.422	0.040	1	-0.462	-0.774	16516					
1994	7.132	0.935	-0.672	-0.067	1	-0.605	-1.014	14842					
1995	10.325	1.161	-0.302	0.149	1	-0.451	-0.755	18419					
1996	31.392	1.800	0.810	0.588	1	0.223	0.373	28556					
1997	17.236	1.201	0.211	0.183	1	0.027	0.046	19056					
1998	0.000	0.000	0	0	1	0.000	0.000	00					

Partial Variance: 0.13

spr_ma

Tuned to: 1-Jan

For ages: 5

Year	Obs.	Pred.	Scd.	Obs.	Scd.	Pred.Wt.	Wt.	Res.	Std.	Res.	Pred.	Stk.	Sze.
1980	0.000	0.000	0	0	1	0.000	0.000	00				00	
1981	0.000	0.000	0	0	1	0.000	0.000	00				00	
1982	5.000	1.706	0.052	0.534	1	-0.482	-0.807	18751					
1983	10.220	1.560	0.767	0.445	1	0.323	0.540	17151					
1984	4.640	1.411	-0.022	0.344	1	-0.366	-0.614	15508					
1985	3.770	0.672	-0.230	-0.398	1	0.168	0.281	7384					
1986	2.840	0.670	-0.513	-0.400	1	-0.113	-0.189	7366					
1987	1.760	0.706	-0.992	-0.348	1	-0.644	-1.078	7763					
1988	1.540	0.354	-1.125	-1.040	1	-0.086	-0.143	3887					
1989	3.030	0.274	-0.448	-1.296	1	0.848	1.420	3008					
1990	3.430	0.499	-0.324	-0.696	1	0.372	0.622	5481					
1991	3.240	1.107	-0.381	0.102	1	-0.483	-0.809	12167					
1992	7.422	1.459	0.447	0.378	1	0.070	0.117	16037					
1993	3.448	0.785	-0.319	-0.242	1	-0.077	-0.129	8630					
1994	3.879	0.889	-0.201	-0.117	1	-0.084	-0.141	9775					
1995	3.156	0.889	-0.408	-0.117	1	-0.290	-0.486	9774					
1996	6.326	0.837	0.288	-0.178	1	0.466	0.781	9196					
1997	12.209	1.761	0.945	0.566	1	0.379	0.635	19360					
1998	0.000	0.000	0	0	1	0.000	0.000	00					

Partial Variance: 0.169

ma1aut

Tuned to: 1-Jan

For ages: 2

Year	Obs.	Pred.	Scd.	Obs.	Scd.	Pred.Wt.	Wt.	Res.	Std.	Res.	Pred.	Stk.	Sze.
1980	0.000	0.000	0	0	1	0.000	0.000	00				00	
1981	0.000	0.000	0	0	1	0.000	0.000	00				00	
1982	0.000	0.000	0	0	1	0.000	0.000	00				00	
1983	13.240	0.668	-1.070	-0.403	1	-0.666	-1.116	16809					
1984	52.170	0.707	0.302	-0.346	1	0.648	1.086	17796					
1985	3.140	0.413	-2.509	-0.885	1	-1.624	-2.720	10389					
1986	60.970	0.398	0.458	-0.921	1	1.378	2.309	10020					
1987	41.270	0.571	0.067	-0.560	1	0.627	1.050	14377					
1988	46.360	1.181	0.184	0.167	1	0.017	0.028	29724					
1989	85.630	1.705	0.797	0.533	1	0.264	0.442	42893					
1990	57.560	0.854	0.400	-0.158	1	0.558	0.935	21487					
1991	31.990	1.051	-0.187	0.050	1	-0.238	-0.398	26458					
1992	24.070	0.999	-0.472	-0.001	1	-0.471	-0.789	25139					
1993	46.329	1.144	0.183	0.135	1	0.048	0.081	28790					

1994	76.207	1.838	0.681	0.609	1	0.072	0.121	46244
1995	36.710	1.271	-0.050	0.240	1	-0.290	-0.485	31986
1996	11.841	0.524	-1.181	-0.647	1	-0.534	-0.895	13177
1997	16.253	0.481	-0.865	-0.732	1	-0.132	-0.221	12097
1998	13.611	0.250	-1.042	-1.385	1	0.343	0.574	6301

Partial Variance: 0.473

ma2aut

Tuned to: 1-Jan

For ages: 3

Year	Obs.	Pred.	Scd.	Obs.	Scd.	Pred.Wt.	Wt.	Res.	Std.	Res.	Pred.	Stk.	Sze.
1980	0.000	0.000	0	0	0	1	0.000	0.000	0.000	0.000	00		
1981	0.000	0.000	0	0	0	1	0.000	0.000	0.000	0.000	00		
1982	0.000	0.000	0	0	0	1	0.000	0.000	0.000	0.000	00		
1983	15.460	0.697	-0.887	-0.361	1	-0.526	-0.881	15276					
1984	18.980	0.608	-0.682	-0.497	1	-0.184	-0.309	13331					
1985	13.240	0.653	-1.042	-0.426	1	-0.616	-1.032	14314					
1986	9.450	0.373	-1.379	-0.986	1	-0.394	-0.659	8181					
1987	40.080	0.360	0.066	-1.023	1	1.088	1.823	7885					
1988	14.600	0.512	-0.944	-0.670	1	-0.274	-0.459	11217					
1989	41.280	1.084	0.095	0.081	1	0.014	0.024	23771					
1990	122.250	1.534	1.181	0.428	1	0.753	1.262	33622					
1991	14.200	0.775	-0.972	-0.255	1	-0.717	-1.200	16980					
1992	90.360	0.975	0.879	-0.026	1	0.904	1.514	21370					
1993	12.995	0.929	-1.061	-0.073	1	-0.987	-1.654	20373					
1994	36.798	1.058	-0.020	0.056	1	-0.076	-0.127	23186					
1995	79.314	1.706	0.748	0.534	1	0.214	0.358	37404					
1996	44.218	1.133	0.164	0.125	1	0.039	0.065	24842					
1997	19.247	0.453	-0.668	-0.791	1	0.123	0.206	9942					
1998	28.084	0.395	-0.290	-0.929	1	0.639	1.070	8660					

Partial Variance: 0.37

ma3aut

Tuned to: 1-Jan

For ages: 4

Year	Obs.	Pred.	Scd.	Obs.	Scd.	Pred.Wt.	Wt.	Res.	Std.	Res.	Pred.	Stk.	Sze.
1980	0.000	0.000	0	0	0	1	0.000	0.000	0.000	0.000	00		
1981	0.000	0.000	0	0	0	1	0.000	0.000	0.000	0.000	00		
1982	0.000	0.000	0	0	0	1	0.000	0.000	0.000	0.000	00		
1983	10.220	1.522	-0.564	0.420	1	-0.985	-1.649	24319					
1984	10.020	0.713	-0.584	-0.338	1	-0.246	-0.412	11388					
1985	4.270	0.637	-1.437	-0.450	1	-0.987	-1.653	10182					
1986	14.210	0.697	-0.235	-0.361	1	0.126	0.211	11136					
1987	12.070	0.375	-0.398	-0.981	1	0.583	0.976	5991					
1988	3.000	0.338	-1.790	-1.086	1	-0.704	-1.180	5394					
1989	13.980	0.497	-0.251	-0.699	1	0.448	0.751	7938					
1990	31.030	1.115	-0.546	0.109	1	0.438	0.733	17806					
1991	20.120	1.531	0.113	0.426	1	-0.313	-0.524	24461					
1992	40.050	0.814	0.801	-0.206	1	1.008	1.688	12997					
1993	29.794	1.034	0.506	0.033	1	0.472	0.791	16516					
1994	17.588	0.929	-0.021	-0.074	1	0.052	0.087	14842					
1995	10.763	1.153	-0.513	0.142	1	-0.655	-1.097	18419					
1996	24.928	1.788	0.327	0.581	1	-0.254	-0.425	28556					
1997	27.555	1.193	0.428	0.176	1	0.251	0.421	19056					
1998	17.907	0.464	-0.003	-0.768	1	0.764	1.280	7413					

Partial Variance: 0.389

ma4aut

Tuned to: 1-Jan

For ages: 5

Year	Obs.	Pred.	Scd.	Obs.	Scd.	Pred.Wt.	Wt.	Res.	Std.	Res.	Pred.	Stk.	Sze.
1980	0.000	0.000	0	0	0	1	0.000	0.000	0.000	0.000	00		
1981	0.000	0.000	0	0	0	1	0.000	0.000	0.000	0.000	00		
1982	0.000	0.000	0	0	0	1	0.000	0.000	0.000	0.000	00		
1983	5.110	1.340	-0.107	0.293	1	-0.400	-0.670	17151					
1984	8.300	1.212	0.378	0.192	1	0.186	0.311	15508					
1985	1.830	0.577	-1.134	-0.550	1	-0.584	-0.979	7384					
1986	1.560	0.576	-1.294	-0.552	1	-0.741	-1.242	7366					
1987	5.300	0.607	-0.071	-0.500	1	0.429	0.719	7763					
1988	0.520	0.304	-2.392	-1.192	1	-1.201	-2.011	3887					

1989	1.340	0.235	-1.446	-1.448	1	0.002	0.004	3008
1990	2.330	0.428	-0.892	-0.848	1	-0.045	-0.075	5481
1991	3.930	0.951	-0.370	-0.050	1	-0.319	-0.535	12167
1992	11.510	1.253	0.705	0.226	1	0.479	0.803	16037
1993	11.044	0.674	0.664	-0.394	1	1.057	1.771	8630
1994	6.851	0.764	0.186	-0.269	1	0.455	0.763	9775
1995	2.906	0.764	-0.672	-0.269	1	-0.402	-0.674	9774
1996	4.214	0.719	-0.300	-0.330	1	0.030	0.051	9196
1997	13.965	1.513	0.898	0.414	1	0.484	0.811	19360
1998	10.293	1.026	0.593	0.025	1	0.568	0.951	13123

Partial Variance: 0.346

ma5aut

Tuned to: 1-Jan

For ages: 6

Year	Obs.	Pred.	Scd.	Obs.	Scd.	Pred.Wt.	Wt.	Res.	Std.	Res.	Pred.	Stk.	Sze.
1980	0.000	0.000	0	0	1	1	0.000	0.000	00				
1981	0.000	0.000	0	0	1	1	0.000	0.000	00				
1982	0.000	0.000	0	0	1	1	0.000	0.000	00				
1983	1.140	1.708	0.235	0.535	1	-0.300	-0.502	11343					
1984	1.390	1.464	0.434	0.381	1	0.053	0.088	9721					
1985	0.770	1.145	-0.157	0.136	1	-0.293	-0.490	7607					
1986	0.140	0.614	-1.862	-0.488	1	-1.374	-2.302	4077					
1987	0.390	0.689	-0.837	-0.372	1	-0.465	-0.779	4578					
1988	0.230	0.683	-1.365	-0.381	1	-0.984	-1.648	4536					
1989	0.450	0.271	-0.694	-1.304	1	0.610	1.021	1803					
1990	0.130	0.258	-1.936	-1.355	1	-0.581	-0.973	1713					
1991	0.210	0.489	-1.456	-0.715	1	-0.741	-1.242	3249					
1992	1.170	1.036	0.261	0.036	1	0.226	0.378	6883					
1993	1.378	1.049	0.425	0.048	1	0.377	0.631	6968					
1994	1.710	0.576	0.641	-0.552	1	1.193	1.998	3824					
1995	1.557	0.598	0.547	-0.515	1	1.062	1.779	3969					
1996	0.905	0.547	0.004	-0.603	1	0.607	1.017	3636					
1997	1.387	0.731	0.431	-0.314	1	0.745	1.248	4853					
1998	1.459	1.853	0.482	0.617	1	-0.135	-0.225	12304					

Partial Variance: 0.557

Partial variance (and proportion of total) by index

0.874	0.396	0.239	0.091	0.084	0.151	0.191	0.556	0.379	0.137	0.176	0.114
0.241	0.382	0.43	1.329	0.713	0.17	0.13	0.169	0.473	0.37	0.389	0.346
0.557											
0.096	0.044	0.026	0.01	0.009	0.017	0.021	0.061	0.042	0.015	0.019	0.013
0.027	0.042	0.047	0.146	0.079	0.019	0.014	0.019	0.052	0.041	0.043	0.038
0.061											

Standardized residuals by index and year; with row/column/grand means

	1980	1981	1982	1983	1984	1985	1986					
spr_us1	2.337	1.124	0.075	2.000	-0.961	-0.223	-2.672					
spr_us2	1.215	1.177	0.414	2.779	-1.257	-0.506	0.163					
spr_us3	0.724	0.757	-0.687	1.647	-1.082	-0.293	-1.130					
spr_us4	0.258	0.272	0.246	0.916	-0.502	-0.390	-0.271					
spr_us5	0.481	0.717	0.210	0.719	-0.299	-0.023	-0.376					
spr_us6	0.165	0.646	0.890	0.367	-0.564	0.506	-0.270					
spr_us7	0.487	0.994	0.652	0.895	-1.138	0.309	-0.460					
spr_us8	-0.054	1.659	0.667	0.860	0.312	1.727	-0.139					
us2aut2	0.000	0.154	-0.760	-1.794	-0.355	-0.828	1.629					
us2aut3	0.000	-0.825	-0.415	-0.998	-0.595	0.620	-0.086					
us3aut4	0.000	-0.803	-0.979	-1.386	0.224	-0.021	0.735					
us4aut5	0.000	0.025	-0.246	-1.309	0.254	0.021	-0.180					
us5aut6	0.000	-0.568	0.796	-1.850	-0.135	-0.126	0.452					
us6aut7	0.000	-0.380	0.724	-0.223	-0.049	-0.319	-0.140					
us7aut8	0.000	1.015	0.170	-0.166	1.444	-1.290	0.019					
spr_ma1	0.000	0.000	0.370	-1.923	-0.846	3.074	2.846					
spr_ma2	0.000	0.000	1.167	-0.201	0.340	0.455	3.632					
spr_ma3	0.000	0.000	-0.604	0.024	0.168	0.263	1.376					
spr_ma4	0.000	0.000	-0.462	0.005	0.089	0.098	0.648					
spr_ma5	0.000	0.000	-0.807	0.540	-0.614	0.281	-0.189					
ma1aut2	0.000	0.000	0.000	-1.116	1.086	-2.720	2.309					

ma2aut3	0.000	0.000	0.000	-0.881	-0.309	-1.032	-0.659
ma3aut4	0.000	0.000	0.000	-1.649	-0.412	-1.653	0.211
ma4aut5	0.000	0.000	0.000	-0.670	0.311	-0.979	-1.242
ma5aut6	0.000	0.000	0.000	-0.502	0.088	-0.490	-2.302
Col Avg	0.702	0.398	0.071	-0.157	-0.192	-0.142	0.156

1987 1988 1989 1990 1991 1992 1993

spr_us1	0.282	0.522	-0.645	0.000	-1.756	-0.823	1.238
spr_us2	0.308	-0.375	-0.196	-0.756	-0.737	-1.885	-0.597
spr_us3	1.016	-0.143	-0.709	-0.058	0.273	-0.697	-0.602
spr_us4	0.398	0.467	0.027	-1.041	-0.189	-0.761	-0.182
spr_us5	-0.408	-0.383	0.813	-0.029	-0.472	-0.682	-0.585
spr_us6	-0.464	-0.837	1.097	0.289	-0.994	-0.487	-0.432
spr_us7	0.382	-0.783	-0.211	-0.363	0.017	-0.195	-0.566
spr_us8	-0.033	-2.408	-1.646	-0.815	0.623	0.902	1.621
us1aut2	0.036	-1.116	1.081	-0.739	0.844	-1.037	-0.721
us2aut3	0.924	0.078	0.243	0.339	0.349	0.119	-0.976
us3aut4	-0.073	0.281	1.110	0.058	1.138	0.011	-0.546
us4aut5	0.241	-0.637	0.790	0.168	0.643	-0.820	-0.146
us5aut6	-0.653	0.005	0.907	-0.524	0.302	-0.599	-0.509
us6aut7	0.949	-0.355	-1.799	-0.309	1.348	0.684	-0.416
us7aut8	0.013	0.531	-1.144	-2.894	1.400	-0.015	0.479
spr_ma1	2.037	2.868	0.150	-0.265	-2.360	-0.306	-0.521
spr_ma2	-0.079	0.888	1.436	-0.107	-0.856	-1.761	-1.083
spr_ma3	0.545	0.160	0.450	0.257	0.582	0.158	-1.015
spr_ma4	-0.505	1.019	0.905	0.085	-0.211	0.453	-0.774
spr_ma5	-1.078	-0.143	1.420	0.622	-0.809	0.117	-0.129
ma1aut2	1.050	0.028	0.442	0.935	-0.398	-0.789	0.081
ma2aut3	1.823	-0.459	0.024	1.262	-1.200	1.514	-1.654
ma3aut4	0.976	-1.180	0.751	0.733	-0.524	1.688	0.791
ma4aut5	0.719	-2.011	0.004	-0.075	-0.535	0.803	1.771
ma5aut6	-0.779	-1.648	1.021	-0.973	-1.242	0.378	0.631
Col Avg	0.305	-0.225	0.253	-0.175	-0.191	-0.161	-0.194

1994 1995 1996 1997 1998

spr_us1	-2.172	3.154	-1.151	-0.330	0.000
spr_us2	-0.499	0.658	-0.260	0.876	-0.524
spr_us3	-0.848	0.086	-0.077	1.211	0.612
spr_us4	-0.579	0.270	0.133	0.351	0.578
spr_us5	-0.448	0.208	0.588	0.098	-0.128
spr_us6	-0.551	0.462	0.929	-0.061	-0.692
spr_us7	-1.319	0.991	1.054	-0.479	-0.268
spr_us8	-1.338	-1.382	0.388	-1.757	0.813
us1aut2	0.106	2.074	0.149	0.427	0.848
us2aut3	-0.108	1.042	0.582	-0.480	0.189
us3aut4	0.686	-0.029	-0.249	-0.657	0.499
us4aut5	0.613	0.131	0.869	-0.225	-0.193
us5aut6	0.995	1.290	0.821	0.389	-0.994
us6aut7	1.397	-2.635	0.388	1.104	0.032
us7aut8	-0.079	1.492	-0.727	0.327	-0.577
spr_ma1	0.087	-3.607	-1.015	-0.589	0.000
spr_ma2	-0.171	-0.251	-2.324	-1.086	0.000
spr_ma3	-0.697	-0.144	-1.472	-0.051	0.000
spr_ma4	-1.014	-0.755	0.373	0.046	0.000
spr_ma5	-0.141	-0.486	0.781	0.635	0.000
ma1aut2	0.121	-0.485	-0.895	-0.221	0.574
ma2aut3	-0.127	0.358	0.065	0.206	1.070
ma3aut4	0.087	-1.097	-0.425	0.421	1.280
ma4aut5	0.763	-0.674	0.051	0.811	0.951
ma5aut6	1.998	1.779	1.017	1.248	-0.225
Col Avg	-0.130	0.098	-0.016	0.089	0.192

Percent of total sum of squares by index and year; with row/column sums

	1980	1981	1982	1983	1984	1985	1986
spr_us1	1.349	0.312	0.001	0.988	0.228	0.012	1.763

spr_us2	0.364	0.342	0.042	1.908	0.390	0.063	0.007
spr_us3	0.129	0.142	0.117	0.669	0.289	0.021	0.315
spr_us4	0.016	0.018	0.015	0.207	0.062	0.038	0.018
spr_us5	0.057	0.127	0.011	0.127	0.022	0.000	0.035
spr_us6	0.007	0.103	0.195	0.033	0.079	0.063	0.018
spr_us7	0.058	0.244	0.105	0.198	0.320	0.024	0.052
spr_us8	0.001	0.680	0.110	0.183	0.024	0.736	0.005
us1aut2	0.000	0.006	0.143	0.794	0.031	0.169	0.655
us2aut3	0.000	0.168	0.043	0.246	0.088	0.095	0.002
us3aut4	0.000	0.159	0.237	0.474	0.012	0.000	0.133
us4aut5	0.000	0.000	0.015	0.423	0.016	0.000	0.008
us5aut6	0.000	0.080	0.157	0.845	0.004	0.004	0.051
us6aut7	0.000	0.036	0.130	0.012	0.001	0.025	0.005
us7aut8	0.000	0.254	0.007	0.007	0.515	0.411	0.000
spr_ma1	0.000	0.000	0.034	0.913	0.177	2.334	2.000
spr_ma2	0.000	0.000	0.336	0.010	0.029	0.051	3.258
spr_ma3	0.000	0.000	0.090	0.000	0.007	0.017	0.468
spr_ma4	0.000	0.000	0.053	0.000	0.002	0.002	0.104
spr_ma5	0.000	0.000	0.161	0.072	0.093	0.020	0.009
ma1aut2	0.000	0.000	0.000	0.307	0.291	1.827	1.316
ma2aut3	0.000	0.000	0.000	0.192	0.024	0.263	0.107
ma3aut4	0.000	0.000	0.000	0.672	0.042	0.674	0.011
ma4aut5	0.000	0.000	0.000	0.111	0.024	0.236	0.381
ma5aut6	0.000	0.000	0.000	0.062	0.002	0.059	1.308

++	1.982	2.671	2.000	9.455	2.771	7.146	12.028
	1987	1988	1989	1990	1991	1992	1993

spr_us1	0.020	0.067	0.103	0.000	0.761	0.167	0.378
spr_us2	0.023	0.035	0.009	0.141	0.134	0.877	0.088
spr_us3	0.255	0.005	0.124	0.001	0.018	0.120	0.090
spr_us4	0.039	0.054	0.000	0.267	0.009	0.143	0.008
spr_us5	0.041	0.036	0.163	0.000	0.055	0.115	0.085
spr_us6	0.053	0.173	0.297	0.021	0.244	0.059	0.046
spr_us7	0.036	0.151	0.011	0.033	0.000	0.009	0.079
spr_us8	0.000	1.432	0.669	0.164	0.096	0.201	0.649
us1aut2	0.000	0.308	0.289	0.135	0.176	0.265	0.128
us2aut3	0.211	0.001	0.015	0.028	0.030	0.003	0.235
us3aut4	0.001	0.020	0.304	0.001	0.320	0.000	0.074
us4aut5	0.014	0.100	0.154	0.007	0.102	0.166	0.005
us5aut6	0.105	0.000	0.203	0.068	0.023	0.089	0.064
us6aut7	0.223	0.031	0.799	0.024	0.448	0.116	0.043
us7aut8	0.000	0.070	0.323	2.068	0.484	0.000	0.057
spr_ma1	1.025	2.031	0.006	0.017	1.375	0.023	0.067
spr_ma2	0.002	0.195	0.509	0.003	0.181	0.766	0.290
spr_ma3	0.073	0.006	0.050	0.016	0.084	0.006	0.254
spr_ma4	0.063	0.256	0.202	0.002	0.011	0.051	0.148
spr_ma5	0.287	0.005	0.498	0.096	0.162	0.003	0.004
ma1aut2	0.272	0.000	0.048	0.216	0.039	0.154	0.002
ma2aut3	0.820	0.052	0.000	0.393	0.356	0.566	0.676
ma3aut4	0.235	0.344	0.139	0.133	0.068	0.704	0.155
ma4aut5	0.128	0.999	0.000	0.001	0.071	0.159	0.775
ma5aut6	0.150	0.671	0.258	0.234	0.381	0.035	0.098

++	4.078	7.042	5.174	4.067	5.626	4.797	4.495
	1994	1995	1996	1997	1998	++	

spr_us1	1.165	2.456	0.327	0.027	0.000	10.124
spr_us2	0.062	0.107	0.017	0.189	0.068	4.866
spr_us3	0.178	0.002	0.001	0.362	0.093	2.931
spr_us4	0.083	0.018	0.004	0.030	0.082	1.113
spr_us5	0.050	0.011	0.085	0.002	0.004	1.026
spr_us6	0.075	0.053	0.213	0.001	0.118	1.850
spr_us7	0.430	0.243	0.274	0.057	0.018	2.342
spr_us8	0.442	0.472	0.037	0.762	0.163	6.825

us1aut2	0.003	1.062	0.005	0.045	0.178	0.000
us2aut3	0.003	0.268	0.084	0.057	0.009	0.000
us3aut4	0.116	0.000	0.015	0.107	0.062	4.393
us4aut5	0.093	0.004	0.187	0.013	0.009	1.585
us5aut6	0.244	0.411	0.166	0.037	0.244	2.036
us6aut7	0.482	1.715	0.037	0.301	0.000	1.317
us7aut8	0.002	0.550	0.130	0.026	0.082	2.794
spr_ma1	0.002	3.213	0.254	0.086	0.000	4.426
spr_ma2	0.007	0.016	1.333	0.291	0.000	4.985
spr_ma3	0.120	0.005	0.535	0.001	0.000	0.000
spr_ma4	0.254	0.141	0.034	0.001	0.000	0.000
spr_ma5	0.005	0.058	0.151	0.100	0.000	13.557
ma1aut2	0.004	0.058	0.198	0.012	0.081	7.275
ma2aut3	0.004	0.032	0.001	0.010	0.283	1.733
ma3aut4	0.002	0.297	0.045	0.044	0.405	1.323
ma4aut5	0.144	0.112	0.001	0.162	0.223	1.722
ma5aut6	0.986	0.781	0.255	0.385	0.013	0.000

++	4.952	12.083	4.391	3.108	2.134	100.000
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STOCK NUMBERS (Jan 1) in thousands - C:\Program Files\WHAT\ap\ap90.41

	1980	1981	1982	1983	1984	1985	1986
1	50702	23856	20595	21754	12745	12305	17694
2	41263	41501	19497	16809	17796	10389	10020
3	35738	33618	33071	15276	13331	14314	8181
4	24117	28298	25665	24319	11388	10182	11136
5	21641	17360	18751	17151	15508	7384	7366
6	17355	14162	9428	11343	9721	7607	4077
7	11140	10650	8291	4520	5772	5086	3675
8	5135	5834	6545	3809	1651	2980	2160
9	14503	6248	8628	6117	3825	2420	1562
1+	221593	181527	150471	121097	91738	72667	65873
	1987	1988	1989	1990	1991	1992	1993
1	36417	52580	26390	32391	30720	35205	56601
2	14377	29724	42893	21487	26458	25139	28790
3	7885	11217	23771	33622	16980	21370	20373
4	5991	5394	7938	17806	24461	12997	16516
5	7763	3887	3008	5481	12167	16037	8630
6	4578	4536	1803	1713	3249	6883	6968
7	2011	2546	2413	991	922	1644	3170
8	1826	837	1593	1294	548	464	605
9	1031	987	1379	1656	1333	792	1268
1+	81878	111708	111188	116440	116838	120529	142922
	1994	1995	1996	1997	1998		
1	39386	16667	14990	7870	00		
2	46244	31986	13177	12097	6301		
3	23186	37404	24842	9942	8660		
4	14842	18419	28556	19056	7413		
5	9775	9774	9196	19360	13123		
6	3824	3969	3636	4853	12304		

7	2865	1590	1439	1646	2434
8	1326	1180	710	681	698
9	1481	627	630	983	854

1+	142929	121616	97175	76486	51786
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FISHING MORTALITY - C:\Program Files\WHAT\ap\ap90.41

	1980	1981	1982	1983	1984	1985	1986
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1	0.00	0.00	0.00	0.00	0.00	0.01	0.01
2	0.00	0.03	0.04	0.03	0.02	0.04	0.04
3	0.03	0.07	0.11	0.09	0.07	0.05	0.11
4	0.13	0.21	0.20	0.25	0.23	0.12	0.16
5	0.22	0.41	0.30	0.37	0.51	0.39	0.28
6	0.29	0.34	0.54	0.48	0.45	0.53	0.51
7	0.45	0.29	0.58	0.81	0.46	0.66	0.50
8	0.29	0.36	0.42	0.46	0.49	0.51	0.39
9	0.29	0.36	0.42	0.46	0.49	0.51	0.39

1987	1988	1989	1990	1991	1992	1993
------	------	------	------	------	------	------

1	0.00	0.00	0.01	0.00	0.00	0.00	0.00
2	0.05	0.02	0.04	0.04	0.01	0.01	0.02
3	0.18	0.15	0.09	0.12	0.07	0.06	0.12
4	0.23	0.38	0.17	0.18	0.22	0.21	0.32
5	0.34	0.57	0.36	0.32	0.37	0.63	0.61
6	0.39	0.43	0.40	0.42	0.48	0.58	0.69
7	0.68	0.27	0.42	0.39	0.49	0.80	0.67
8	0.40	0.44	0.40	0.35	0.40	0.64	0.66
9	0.40	0.44	0.40	0.35	0.40	0.64	0.66

1994	1995	1996	1997
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1	0.01	0.03	0.01	0.02
2	0.01	0.05	0.08	0.13
3	0.03	0.07	0.07	0.09
4	0.22	0.49	0.19	0.17
5	0.70	0.79	0.44	0.25
6	0.68	0.81	0.59	0.49
7	0.69	0.61	0.55	0.66
8	0.71	0.79	0.49	0.47
9	0.71	0.79	0.49	0.47

Average F for 2,8 3,8 4,8 5,8 6,8

1980	1981	1982	1983	1984	1985	1986	
2,8	0.20	0.24	0.31	0.36	0.32	0.33	0.28
3,8	0.24	0.28	0.36	0.41	0.37	0.38	0.32
4,8	0.28	0.32	0.41	0.47	0.43	0.44	0.37
5,8	0.31	0.35	0.46	0.53	0.48	0.52	0.42
6,8	0.34	0.33	0.51	0.58	0.47	0.57	0.47

1987	1988	1989	1990	1991	1992	1993
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2,8	0.32	0.32	0.27	0.26	0.29	0.42	0.44
3,8	0.37	0.37	0.31	0.30	0.34	0.49	0.51
4,8	0.41	0.42	0.35	0.33	0.39	0.57	0.59
5,8	0.45	0.43	0.40	0.37	0.43	0.66	0.66
6,8	0.49	0.38	0.41	0.39	0.46	0.67	0.67

	1994	1995	1996	1997
2,8	0.43	0.52	0.34	0.32
3,8	0.50	0.59	0.39	0.36
4,8	0.60	0.70	0.45	0.41
5,8	0.69	0.75	0.52	0.47
6,8	0.69	0.74	0.54	0.54

Average F weighted by N for 2,8 3,8 4,8 5,8 6,8

	1980	1981	1982	1983	1984	1985	1986
2,8	0.13	0.17	0.23	0.27	0.26	0.24	0.21
3,8	0.18	0.23	0.27	0.32	0.34	0.29	0.26
4,8	0.24	0.30	0.34	0.38	0.42	0.39	0.30
5,8	0.30	0.35	0.42	0.46	0.48	0.51	0.39
6,8	0.34	0.32	0.52	0.55	0.46	0.57	0.48
	1987	1988	1989	1990	1991	1992	1993
2,8	0.22	0.17	0.11	0.14	0.16	0.24	0.25
3,8	0.31	0.31	0.17	0.17	0.23	0.33	0.36
4,8	0.35	0.42	0.29	0.24	0.29	0.49	0.50
5,8	0.40	0.44	0.39	0.35	0.40	0.63	0.65
6,8	0.46	0.38	0.41	0.39	0.47	0.62	0.68
	1994	1995	1996	1997			
2,8	0.17	0.25	0.19	0.21			
3,8	0.29	0.34	0.21	0.23			
4,8	0.48	0.63	0.29	0.26			
5,8	0.69	0.78	0.49	0.33			
6,8	0.69	0.76	0.57	0.53			

Average F for weighted by Catch for 2,8 3,8 4,8 5,8 6,8

	1980	1981	1982	1983	1984	1985	1986
2,8	0.26	0.28	0.34	0.39	0.42	0.44	0.32
3,8	0.27	0.29	0.35	0.40	0.42	0.45	0.33
4,8	0.28	0.32	0.39	0.42	0.44	0.48	0.36
5,8	0.31	0.36	0.45	0.49	0.48	0.52	0.42
6,8	0.35	0.32	0.53	0.57	0.46	0.57	0.48
	1987	1988	1989	1990	1991	1992	1993
2,8	0.33	0.35	0.20	0.20	0.29	0.51	0.47
3,8	0.35	0.38	0.25	0.21	0.29	0.52	0.48
4,8	0.39	0.44	0.33	0.27	0.32	0.56	0.54
5,8	0.42	0.46	0.39	0.36	0.40	0.63	0.65
6,8	0.48	0.39	0.41	0.39	0.47	0.63	0.68
	1994	1995	1996	1997			
2,8	0.52	0.53	0.30	0.27			
3,8	0.55	0.57	0.32	0.29			
4,8	0.58	0.65	0.36	0.31			
5,8	0.69	0.78	0.50	0.37			
6,8	0.69	0.77	0.57	0.53			

Biomass Weighted F

	1980	1981	1982	1983	1984	1985	1986
	0.25	0.27	0.34	0.38	0.40	0.43	0.33
	1987	1988	1989	1990	1991	1992	1993
	0.34	0.31	0.24	0.22	0.28	0.40	0.40

	1994	1995	1996	1997	
	0.38	0.42	0.29	0.29	

BACKCALCULATED PARTIAL RECRUITMENT						
	1980	1981	1982	1983	1984	1985
1	0.00	0.00	0.01	0.00	0.01	0.01
2	0.01	0.07	0.08	0.04	0.03	0.06
3	0.07	0.17	0.19	0.12	0.14	0.08
4	0.29	0.52	0.35	0.31	0.46	0.19
5	0.50	1.00	0.52	0.46	1.00	0.60
6	0.65	0.82	0.93	0.59	0.87	0.80
7	1.00	0.70	1.00	1.00	0.90	1.00
8	0.66	0.87	0.73	0.57	0.95	0.78
9	0.66	0.87	0.73	0.57	0.95	0.77

	1987	1988	1989	1990	1991	1992	1993
1	0.00	0.01	0.01	0.01	0.00	0.00	0.00
2	0.07	0.04	0.10	0.08	0.03	0.01	0.02
3	0.27	0.26	0.21	0.28	0.14	0.07	0.17
4	0.34	0.68	0.40	0.43	0.46	0.26	0.47
5	0.50	1.00	0.86	0.77	0.76	0.79	0.89
6	0.57	0.76	0.94	1.00	0.99	0.72	1.00
7	1.00	0.47	1.00	0.93	1.00	1.00	0.97
8	0.59	0.78	0.94	0.84	0.83	0.80	0.96
9	0.59	0.78	0.94	0.84	0.83	0.80	0.96

	1994	1995	1996	1997	
1	0.01	0.04	0.02	0.03	
2	0.02	0.06	0.14	0.20	
3	0.04	0.09	0.11	0.14	
4	0.31	0.61	0.32	0.26	
5	0.99	0.97	0.74	0.38	
6	0.96	1.00	1.00	0.74	
7	0.97	0.74	0.92	1.00	
8	1.00	0.97	0.83	0.71	
9	1.00	0.97	0.83	0.71	

MEAN BIOMASS (using catch mean weights at age)

	1980	1981	1982	1983	1984	1985	1986
1	1011	367	298	296	173	200	256
2	2089	3898	1713	570	816	379	383
3	4813	5068	6862	2581	2080	1215	900
4	5488	7470	6337	7697	3013	2018	2580
5	7214	5769	6219	7106	6123	1971	2327
6	8966	8531	3819	5558	4586	2918	1722
7	6800	7445	5537	2350	3759	2911	2226
8	4209	4377	5546	2904	1423	2487	1916
9	17426	6302	9502	6621	4583	2801	2009

1+	58017	49228	45832	35683	26555	16901	14318
	1987	1988	1989	1990	1991	1992	1993
1	494	761	286	616	418	893	820
2	611	1172	1561	1110	1263	1474	2019
3	1043	1707	2787	3974	1788	2995	3702
4	1274	1271	1824	3924	6585	3359	3907

5	2637	1253	1026	1942	4619	5277	2563
6	2120	2163	768	816	1673	3434	2724
7	1196	1813	1322	616	640	985	1981
8	1612	761	1029	962	478	378	500
9	1309	1188	1597	1719	1481	867	1400

1+	12296	12089	12200	15679	18945	19662	19614
	1994	1995	1996	1997			
1	498	178	189	99			
2	1167	763	436	216			
3	4018	6655	2400	956			
4	3979	4276	7997	5026			
5	2693	2812	3221	6258			
6	1436	1611	1599	2121			
7	1449	992	914	824			
8	944	873	600	473			
9	1759	556	753	1122			
1+	17943	18715	18109	17095	00		

Summaries for ages 2,8 3,8 4,8 5,8 6,8

	1980	1981	1982	1983	1984	1985	1986
2,8	39579	42558	36033	28766	21799	13900	12054
3,8	37490	38660	34320	28196	20984	13521	11671
4,8	32677	33592	27458	25615	18903	12306	10771
5,8	27189	26122	21121	17918	15891	10288	8191
6,8	19976	20353	14902	10812	9768	8317	5864
	1987	1988	1989	1990	1991	1992	1993
2,8	10492	10140	10316	13345	17046	17902	17395
3,8	9881	8968	8755	12234	15783	16428	15375
4,8	8838	7261	5968	8260	13995	13432	11674
5,8	7564	5990	4144	4336	7410	10073	7766
6,8	4927	4737	3118	2394	2791	4796	5204
	1994	1995	1996	1997			
2,8	15686	17980	17168	15874			
3,8	14519	17217	16731	15658			
4,8	10501	10562	14331	14701			
5,8	6522	6287	6334	9675			
6,8	3829	3475	3113	3417			

Catch BIOMASS (using catch mean weights)

	1980	1981	1982	1983	1984	1985	1986
1	00	01	01	00	01	01	02
2	10	106	75	18	15	15	15
3	161	354	737	242	145	62	100
4	707	1580	1287	1924	703	250	415
5	1616	2368	1882	2614	3137	776	642
6	2585	2861	2044	2643	2054	1540	873
7	3038	2136	3200	1897	1734	1910	1112
8	1239	1558	2339	1338	695	1274	747
9	5131	2243	4008	3050	2237	1435	783
1+	14488	13207	15574	13724	10718	7263	4688
	1987	1988	1989	1990	1991	1992	1993
1	02	03	02	01	00	01	02

2	29	28	68	39	17	15	33
3	188	249	248	469	121	173	432
4	297	488	311	709	1463	704	1268
5	889	712	373	627	1708	3343	1574
6	819	933	306	342	805	1975	1876
7	809	487	559	242	311	788	1330
8	642	335	407	340	192	241	331
9	522	523	632	608	595	553	927

1+	4196	3758	2905	3380	5212	7792	7773
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1994	1995	1996	1997
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1	04	06	03	02
2	14	40	36	29
3	121	465	156	89
4	866	2115	1509	870
5	1889	2218	1415	1585
6	973	1312	948	1039
7	996	602	501	542
8	667	691	296	221
9	1243	441	371	524

1+	6773	7890	5234	4902
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Summaries for ages 2,8 3,8 4,8 5,8 6,8

1980	1981	1982	1983	1984	1985	1986
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2,8	9356	10963	11565	10674	8481	5827	3903
3,8	9346	10858	11490	10656	8466	5812	3888
4,8	9185	10504	10753	10414	8321	5750	3788
5,8	8479	8923	9466	8491	7619	5500	3373
6,8	6863	6555	7584	5877	4482	4724	2731

1987	1988	1989	1990	1991	1992	1993
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2,8	3673	3232	2271	2770	4617	7238	6844
3,8	3644	3204	2203	2730	4600	7223	6811
4,8	3456	2955	1955	2261	4479	7051	6379
5,8	3159	2467	1645	1552	3016	6347	5111
6,8	2270	1756	1272	924	1308	3004	3537

1994	1995	1996	1997
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2,8	5526	7443	4860	4375
3,8	5512	7403	4824	4346
4,8	5391	6938	4668	4257
5,8	4524	4823	3159	3387
6,8	2636	2605	1744	1802

Jan 1 BIOMASS (using Jan 1 mean weights)

1980	1981	1982	1983	1984	1985	1986
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1	507	167	206	174	115	148	159
2	1320	1992	799	420	498	260	281
3	3681	3295	5258	2123	1093	1002	589
4	4992	6254	5826	7490	2870	2067	1815
5	6427	5972	6919	6929	7227	2511	2232
6	9754	7987	4752	6046	5735	4153	1863
7	8500	8084	7172	3105	4474	3758	2477
8	4765	5251	6558	3812	1638	3036	2161
9	22088	8216	12760	9047	6339	3916	2659

1+	62034	47217	50250	39147	29988	20851	14236
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	1987	1988	1989	1990	1991	1992	1993
1	328	526	132	421	215	599	679
2	403	773	1115	559	873	779	1353
3	655	1043	1830	2522	1409	1966	2384
4	1096	1197	1762	3365	5210	2521	3634
5	2702	1353	1119	1940	4417	6415	3193
6	2257	2409	921	915	1845	4116	3728
7	1458	1882	1660	677	722	1348	2597
8	1815	878	1393	1092	536	499	654
9	1740	1609	2120	2239	1971	1281	2089
1+	12452	11668	12052	13729	17199	19523	20310

	1994	1995	1996	1997
1	394	117	165	87
2	971	608	277	206
3	2852	2805	1342	646
4	3918	4605	7482	3544
5	3480	3763	3596	7144
6	1893	2064	1952	2601
7	1922	1138	1098	1134
8	1335	1113	733	631
9	2676	877	1043	1538
1+	19441	17089	17686	17530

Summaries for ages 2,8 3,8 4,8 5,8 6,8

	1980	1981	1982	1983	1984	1985	1986
2,8	39439	38834	37284	29926	23534	16787	11417
3,8	38119	36842	36485	29506	23036	16527	11137
4,8	34438	33547	31227	27382	21943	15525	10548
5,8	29445	27293	25401	19892	19073	13459	8733
6,8	23018	21321	18481	12963	11847	10948	6501
	1987	1988	1989	1990	1991	1992	1993
2,8	10385	9534	9801	11069	15013	17643	17542
3,8	9982	8761	8685	10511	14139	16864	16189
4,8	9328	7718	6855	7989	12730	14898	13805
5,8	8231	6521	5093	4624	7520	12377	10172
6,8	5530	5168	3974	2684	3103	5962	6978
	1994	1995	1996	1997			
2,8	16371	16095	16478	15905			
3,8	15400	15488	16201	15700			
4,8	12548	12682	14860	15054			
5,8	8630	8078	7378	11509			
6,8	5150	4314	3783	4366			

SSB AT THE START OF THE SPAWNING SEASON -MALES AND FEMALES (MT) (using SSB mean weights)

	1980	1981	1982	1983	1984	1985	1986
1	00	00	00	00	00	00	00
2	50	75	30	16	19	10	11
3	833	739	1169	474	245	226	131
4	3311	4063	3793	4819	1854	1372	1194
5	5492	4870	5797	5711	5745	2056	1883
6	8546	6917	3914	5055	4829	3428	1546
7	7230	7157	5904	2414	3792	3034	2079
8	4211	4569	5614	3232	1379	2541	1864
9	19520	7150	10923	7670	5337	3277	2294

1+	49194	35540	37144	29391	23200	15944	11002
	1987	1988	1989	1990	1991	1992	1993
1	00	00	00	00	00	00	00
2	15	29	42	21	33	30	51
3	143	230	409	559	316	442	529
4	708	745	1157	2203	3376	1639	2295
5	2244	1060	923	1617	3639	4948	2475
6	1929	2036	785	775	1541	3357	2955
7	1171	1674	1421	584	608	1050	2088
8	1563	748	1200	951	461	404	527
9	1498	1370	1826	1949	1696	1039	1684
1+	9271	7893	7763	8660	11670	12908	12604
	1994	1995	1996	1997			
1	00	00	00	00			
2	37	23	10	08			
3	646	629	301	144			
4	2541	2787	4888	2325			
5	2639	2792	2911	6059			
6	1505	1585	1585	2167			
7	1540	930	911	915			
8	1065	868	616	534			
9	2133	685	877	1302			

APPENDIX 5

**Precision Estimates of 1997 Fishing Mortality and Spawning Stock Biomass for
Gulf of Maine-Georges Bank American Plaice.**

BOOTSTRAP RESULTS FOR RUN 41
 American Plaice - Georges Bank-Gulf of Maine

Appendix 5. Table 1

The number of bootstraps: 1000
 Bootstrap Output Variable: N hat

	NLLS ESTIMATE	BOOTSTRAP MEAN	BOOTSTRAP StdError	C.V. FOR NLLS SOLN	
N 2	6301	6459	1713	0.27	
N 3	8660	8794	1881	0.22	
N 4	7413	7507	1330	0.18	
N 5	13123	13242	2151	0.16	
N 6	12305	12456	2317	0.19	
N 7	2434	2447	661	0.27	
N 8	698	710	230	0.33	
	BIAS ESTIMATE	BIAS STD ERROR	PERCENT BIAS	NLLS EST CORRECTED FOR BIAS	C.V. FOR CORRECTED ESTIMATE
N 2	158	54	2.51	6142	0.278898
N 3	135	59	1.56	8525	0.220642
N 4	94	42	1.26	7319	0.181772
N 5	119	68	0.90	13005	0.165426
N 6	152	73	1.23	12153	0.190615
N 7	13	21	0.55	2420	0.273054
N 8	13	07	1.82	685	0.335994

Appendix 5: Table 2.

Bootstrap Output Variable: Q_unscaled

	NLLS ESTIMATE	BOOTSTRAP MEAN	BOOTSTRAP StdError	C.V. FOR NLLS SOLN	
q_spr_us1	0.0000028	0.0000028	0.0000004	0.14	
q_spr_us2	0.0000417	0.0000417	0.0000054	0.13	
q_spr_us3	0.0000816	0.0000819	0.0000107	0.13	
q_spr_us4	0.0001066	0.0001078	0.0000140	0.13	
q_spr_us5	0.0001002	0.0001008	0.0000129	0.13	
q_spr_us6	0.0000836	0.0000841	0.0000108	0.13	
q_spr_us7	0.0000752	0.0000761	0.0000099	0.13	
q_spr_us8	0.0000503	0.0000507	0.0000067	0.13	
q_us1aut2	0.0000347	0.0000348	0.0000043	0.13	
q_us2aut3	0.0001081	0.0001096	0.0000147	0.14	
q_us3aut4	0.0001552	0.0001570	0.0000201	0.13	
q_us4aut5	0.0001618	0.0001642	0.0000211	0.13	
q_us5aut6	0.0001516	0.0001526	0.0000212	0.14	
q_us6aut7	0.0001213	0.0001219	0.0000163	0.13	
q_us7aut8	0.0000870	0.0000880	0.0000118	0.14	
q_spr_ma1	0.0002796	0.0002854	0.0000405	0.14	
q_spr_ma2	0.0012586	0.0012676	0.0001744	0.14	
q_spr_ma3	0.0014465	0.0014519	0.0002009	0.14	
q_spr_ma4	0.0008800	0.0008857	0.0001231	0.14	
q_spr_ma5	0.0004316	0.0004355	0.0000588	0.14	
q_ma1aut2	0.0015334	0.0015570	0.0002316	0.15	
q_ma2aut3	0.0017122	0.0017395	0.0002422	0.14	
q_ma3aut4	0.0011249	0.0011338	0.0001583	0.14	
q_ma4aut5	0.0004445	0.0004485	0.0000627	0.14	
q_ma5aut6	0.0001357	0.0001373	0.0000184	0.14	
	BIAS ESTIMATE	BIAS STD ERROR	PERCENT BIAS	NLLS EST CORRECTED FOR BIAS	C.V. FOR CORRECTED ESTIMATE
q_spr_us1	0.00000001	0.000000012	0.494	0.000002771	0.14
q_spr_us2	0.00000008	0.000000170	0.190	0.000041580	0.13
q_spr_us3	0.00000033	0.000000338	0.406	0.000081240	0.13
q_spr_us4	0.00000012	0.000000444	1.052	0.000105510	0.13
q_spr_us5	0.00000054	0.000000409	0.542	0.000099693	0.13
q_spr_us6	0.00000049	0.000000343	0.592	0.000083063	0.13
q_spr_us7	0.00000093	0.000000314	1.238	0.000074266	0.13
q_spr_us8	0.00000046	0.000000211	0.924	0.000049820	0.13
q_us1aut2	0.00000007	0.000000138	0.207	0.000034646	0.13
q_us2aut3	0.00000155	0.000000465	1.434	0.000106544	0.14
q_us3aut4	0.00000181	0.000000634	1.165	0.000153383	0.13
q_us4aut5	0.00000245	0.000000669	1.516	0.000159327	0.13
q_us5aut6	0.00000092	0.000000670	0.607	0.000150728	0.14
q_us6aut7	0.00000057	0.000000517	0.469	0.000120756	0.14
q_us7aut8	0.00000107	0.000000373	1.231	0.000085892	0.14
q_spr_ma1	0.00000578	0.000001282	2.068	0.000273825	0.15
q_spr_ma2	0.00000898	0.000005515	0.714	0.001249653	0.14
q_spr_ma3	0.00000540	0.000006353	0.373	0.001441132	0.14
q_spr_ma4	0.00000565	0.000003892	0.642	0.000874356	0.14
q_spr_ma5	0.00000391	0.000001858	0.906	0.000427704	0.14
q_ma1aut2	0.00002358	0.000007325	1.538	0.001509826	0.15
q_ma2aut3	0.00002730	0.000007658	1.594	0.001684890	0.14
q_ma3aut4	0.00000893	0.000005007	0.794	0.001115932	0.14
q_ma4aut5	0.00000398	0.000002014	0.896	0.000440494	0.14
q_ma5aut6	0.00000164	0.000000581	1.209	0.000134012	0.14

Appendix 5 Table 3.

Bootstrap Output Variable: F t

	NLLS ESTIMATE	BOOTSTRAP MEAN	BOOTSTRAP StdError	C.V. FOR NLLS SOLN
Age 1	0.0224	0.0233	0.0059	0.26
Age 2	0.1342	0.1377	0.0281	0.21
Age 3	0.0935	0.0950	0.0159	0.17
Age 4	0.1730	0.1756	0.0272	0.16
Age 5	0.2532	0.2573	0.0422	0.17
Age 6	0.4900	0.5111	0.1126	0.23
Age 7	0.6581	0.6872	0.1628	0.25
Age 8	0.4671	0.4852	0.0691	0.15
BIAS ESTIMATE	BIAS STD ERROR	PERCENT BIAS	NLLS EST CORRECTED FOR BIAS	C.V. FOR CORRECTED ESTIMATE
Age 1	0.0008961	0.0001871	3.994	0.0215408 0.27
Age 2	0.0034168	0.0008879	2.545	0.1308272 0.21
Age 3	0.0015020	0.0005037	1.606	0.0920038 0.17
Age 4	0.0025631	0.0008611	1.482	0.1704263 0.16
Age 5	0.0040374	0.0013352	1.594	0.2492002 0.17
Age 6	0.0210941	0.0035595	4.305	0.4689497 0.24
Age 7	0.0291151	0.0051489	4.424	0.6289599 0.26
Age 8	0.0180822	0.0021844	3.871	0.4490366 0.15

Appendix 5 Table 4

Bootstrap Output Variable: F full t

	NLLS ESTIMATE	BOOTSTRAP MEAN	BOOTSTRAP StdError	C.V. FOR NLLS SOLN
	0.4671	0.4852	0.0691	0.15
BIAS ESTIMATE	BIAS STD ERROR	PERCENT BIAS	NLLS EST CORRECTED FOR BIAS	C.V. FOR CORRECTED ESTIMATE
0.01808	0.00218	3.87	0.44904	0.15

Appendix 5 Table 5.

Bootstrap Output Variable: SS8 spawn t

	NLLS ESTIMATE	BOOTSTRAP MEAN	BOOTSTRAP StdError	C.V. FOR NLLS SOLN
	13453.6465	13519.7109	1314.9069	0.10
BIAS ESTIMATE	BIAS STD ERROR	PERCENT BIAS	NLLS EST CORRECTED FOR BIAS	C.V. FOR CORRECTED ESTIMATE
66.06	41.58	0.49	13387.58	0.10